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TFS--THE TEXT FORMATTING SYSTEM. A TEXT FORMATTER DESIGNED TO R--ETC(U)
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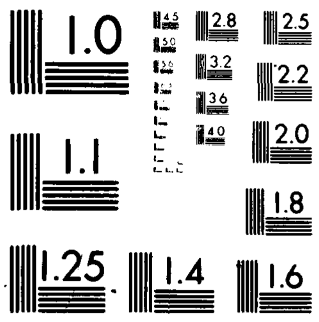
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18. SUPPLEMENTARY NOTES

Source Listing of TFS.ASM is included as part of this report.

19. KEY WORDS (Continue on reverse side if necessary and identify by block number)

Z80 microprocessor, 8080 microprocessor, CP/M, text formatting, word processing, floppy disk

20. ABSTRACT (Continue on reverse side if necessary and identify by block number)

The Text Formatting System (TFS) described by this document is a utility program which runs on the CP/M operating system, Version 1.4. TFS produces a modified listing of the contents of a CP/M text file either on a floppy disk or on a printer page. TFS is a program which interprets control specifications within the text of the file to be formatted and interprets them to produce the formatted listing. These control specifications instruct TFS to perform operations such as

DDC FILE COPY

80 8 13 059

DD FORM 1 JAN 73 1473 EDITION OF 1 NOV 65 IS OBSOLETE

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centering, underlining, right justification, starting a paragraph, pagination, and others.

Unlike other more conventional formatters, however, TFS constructions make up a quasi-programming language. Facilities are included for MACRO definition and application, looping, insertion of data and commands from disk files and incorporation into the document, and interpretive interaction with the user from the console.

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CHAPTER 1

Introduction to the Text Formatting System

The Text Formatting System, hereafter referred to as TFS, is a program which produces a modified printer listing of the contents of a CP/M text file. This listing is formatted; that is, it is modified according to control specifications contained within the file itself. TFS is a program which interprets these control specifications and produces the formatted listing.

TFS IN GENERAL

These control specifications, hereafter referred to as C-specs, are commands of the form '%NAME', where '%' designates that a command name follows and 'NAME', a character string of up to four characters, is the name of the C-spec. For example, the C-spec which turns on underlining in TFS is '%UL'; every word which follows a %UL is underlined until another %UL is encountered.

Naturally, as one may notice at this point, a string starting with a '%' designates a C-spec, and this seems to prohibit the use of the '%' character as the first character of a word. This assumption, however, is not the case. An escape sequence, '%%', has been designated to eliminate this problem. Any word starting with a '%%' is displayed as that word beginning with a single '%'; for example, '%%this' is printed by TFS as '%this'.

A word, as defined by TFS, is a string of characters delimited by either two blanks, the beginning of a line and a blank, the beginning of a line and a carriage return, or a blank and a carriage return. Hence, a word is any string like 'string', where 'string' is delimited by blanks like ' string ', and words may not cross line boundaries in an CP/M text file, since CP/M defines each line of its files to be terminated by a carriage return character (ASCII 0D hexadecimal) and a line feed character (ASCII 0A hexadecimal). TFS is a word-oriented text formatter. It places words in an output line until the line is filled, and then it prints the line. TFS analyzes each word as it reads the word from the CP/M text file, checks to see if the word is a C-spec, formats the word if it is not a C-spec and executes the C-spec if it is, and then continues by reading the next available word in the file. TFS continues until it reaches the end of the file.

TFS operates in basically two modes: (1) ASIS mode (see the %ASIS command)

and (2) normal mode. In normal mode, TFS will read words from the CP/M text file, building the current output line as it goes. All output lines are of a definite length, defined either by default or explicitly by the user, and TFS puts the words it reads into the current output line buffer until it reads a word too large to fit in the remaining space. If there are no words in the line at this time, it will force the word into the line and print the line; otherwise, it will output the line. In outputting a line with right justification, TFS inserts blanks between words in the output line buffer until there is a specified number of characters in the line (the length of the line). It will insert these blanks starting at the right end of the line, going to the left. As a result, the left and right margins of a page produced by TFS line up if right justification is employed. If right justification is not employed, TFS simply outputs the line without filling it. Right justification is the default.

While creating the output line in normal mode, TFS follows the convention that all words ending in a special character ('.','!',':', or '?') are followed by two blanks; all other words are followed by one blank. It is felt that this convention improves readability of the line.

In ASIS mode, TFS simply outputs the lines following the %ASIS C-spec exactly as they appear. Refer to the documentation on the %ASIS command.

TFS C-SPECS

As mentioned earlier, TFS recognizes many commands (or C-specs) during the formatting of an ARIAN file. These C-specs all take the form of '%NAME', where '%' indicates that a C-spec name follows, and 'NAME' is the name of the C-spec. 'NAME' may contain any combination of upper- and lower-case characters; TFS converts all lower-case characters in the name of a C-spec to upper-case. The following is a list of all C-specs recognized by TFS; the chapters of this manual will describe these C-specs in detail.

Type of C-spec: Output Control
UL, RJ, NORJ, ASIS, BR, CR, AP, P, PX, PAGE, SKIP n, HEAD text,
FOOT text, T n, C text, CB, CH n text, COPY n, ENDC, LOOP, ENDL,
TP n, LEX, BS, N, R r, and DR r

Type of C-spec: Parameter Set
PAR n m, PARX n m, LMAR n, LLEN n, LINE n m, PGON n,
PGOF, PNUM n, SP n, BLK c, SETN n, SETR r n, INCR r, and CLRR

Type of C-spec: Data File Manipulation
OPEN filename, CLOS, and READ

Type of C-spec: Miscellaneous
SAV, RES, PAUS text, REM text, APND filename, MAC, ENDM, KB text,
EXIT, STOP, HALT

THE TFS COMMAND

TFS is invoked by typing the TFS command. This command causes the TFS program to be loaded into memory and executed.

The TFS command has four options. These options permit the user to: (1) have TFS stop after printing each page, thereby allowing the user to change paper, (2) to display the formatted output on the user's CRT one line at a time, (3) to have TFS skip to a specified page and start printing the report at that page, and (4) to have TFS send the formatted output to disk. '/P' invokes the first option, while '/Sn', where 'n' is a page number (1-9999), causes TFS to skip to the specified page and start printing on this page. '/V' invokes the second option. As the user may suspect, /V and /Sn and well as /P and /Sn may be combined in the command line. It makes no sense to combine /V and /P, since /V stops after every line anyway. '/D' invokes the fourth option; when invoked, the file 'filename.DOC' is generated, and the user is asked which disk he wishes it to be placed on. /D overrides /V if both options are specified.

The TFS command line, therefore, takes the form --

```
TFS d:filename.ext /o
```

where 'd:' is optional and may specify a drive, '.ext' is optional ('.TFS' is the default), and '/o' is an option. If an invalid option is specified, TFS will display the valid options and abort; hence, if the user desires a brief on-line memory refresh of the TFS options, he may type something like '/?' and receive the valid option list.

CHAPTER 2

Output Control C-specs

The output control C-specs control the output of TFS directly. They include:

1) Line control C-specs, such as %ASIS, %BR, %CR, and %SKIP.
2) Page control C-specs, such as %PAGE, %TP, and %CH.
3) Format control C-specs, such as %UL, %HEAD, %FOOT, %C, %CB, %RJ, %NORJ, %BS, %T, %N, %R, and %DR.
4) Paragraph control C-specs, such as %AP, %P and %PX.
5) and the Copy control C-specs, %COPY, %ENDC, %LOOP, %ENDL, and %LEX.

The %ASIS C-spec instructs TFS to display the following lines exactly as they are without filling the output lines. Only the spacing control is carried over the %ASIS C-spec; for instance, if the output is double-spaced when the %ASIS is encountered, the lines within the %ASIS block are also double-spaced.

An %ASIS block consists of a line of the CP/M text file to be formatted which contains the C-spec '%ASIS' followed by an optional comment, the lines to be printed "asis", and a terminating line beginning with the character '%'. The terminating line must start with the '%' character in the first valid character position of the line. For example, a typical %ASIS block would be:

```
%ASIS [comment]
[text to be displayed without formatting]
%ASIS [comment]
```

The only restriction placed on an '%ASIS' block is that the '%' character may not be placed in the first valid character position of a line without terminating the '%ASIS' block.

All text within an %ASIS block is displayed in the same form as it exists within the source text, with the exception that spacing is carried over from the last %SP command. Also, tabs are expanded within the %ASIS block, so it appears as it was typed into the source text file by using an editor like ED.

The '%UL' C-spec is used to start and stop the underlining process. The group of characters to be underlined are enclosed in '%UL' C-specs. For example, a typical use of %UL is:

```
This text will not be underlined. %UL This text will be
underlined. %UL This text will not.
```

LINE OUTPUT

Lines may be terminated in one of three ways: (1) automatically when TFS determines that the next word will not fit in the current output line, (2) in an implied way when certain TFS C-specs, such as %P, force the output of the current line by the nature of their function, and (3) explicitly in the use of the %BR and %CR C-specs.

%BR (break) and %CR (carriage return) force the output of whatever is in the output line buffer. If more than 10 characters are required to fill the line to make the margins line up, the line is not filled -- it is output exactly as it exists in the buffer. Otherwise, the line is filled as described earlier.

%BR breaks the output line. If the output line buffer is empty, nothing happens on the printer; if it contains something, it is printed, and a carriage return/line feed is output. %CR always performs a carriage return/line feed. If the output buffer is not empty, it acts like a %BR; if the buffer is empty, it outputs just a carriage return/line feed. Hence, if the user wishes to skip down one or two lines, he may insert two %CR's at the appropriate place.

Along the same lines as %BR and %CR, the %SKIP C-spec also can be used to terminate a line. %SKIP is always to be followed by a number 1-99; it acts like the specified number of %CR's. Unlike %CR, however, if the end of the page is encountered before the skipping is completed, a page eject is done and the skipping is stopped. For example, if only three lines are left on the page and a %SKIP 10 is encountered, then only a page eject will be done.

If the user wishes to skip down for the purpose of inserting a diagram in the text, %SKIP alone may not be adequate. If the diagram is to require ten lines and only five lines are left on the page, %SKIP will leave only five lines for the diagram.

To get around this problem, the %TP (test page) C-spec is implemented. This C-spec, which is also always followed by a number from 1-99, tests to see if the specified number of physical lines is left on the current page, and, if such is not the case, it forces a page eject. Hence, to ensure leaving ten lines for the diagram, a %TP 10 followed by a %SKIP 10 may be used. If the ten lines are not available on the current page, a page eject is done followed by the skip; otherwise, just the skip is done.

Another C-spec available to the user is the %PAGE C-spec, which forces a page eject. The advantages of this C-spec are obvious.

The normal output of TFS is right- and left-justified, and TFS provides two control C-specs which may be used to selectively engage and disengage the right justification feature. %RJ engages right justification, and %NORJ disengages it. Right justification is the default.

PARAGRAPHS

TFS supports basically two types of paragraphs -- normal, indented paragraphs and exdented paragraphs. Indented paragraphs are as one would expect a paragraph to be. The paragraph starts with the first word indented a specified number of characters in from the left margin. TFS permits indentation of from 0 to 99 characters.

Exdented paragraphs are displayed as the first line extending a specified number of characters to the left of the left margin. The lists presented in this manual are formed using exdented paragraphs. Obviously, the left margin must be greater in length than the number of characters to be extended; if such is not the case, an error message is printed in the output. It makes no sense to extend a line beyond the first character space the printer can print in.

The %PAR and %PARX C-specs define the characteristics of the paragraphs to follow. These C-specs, which are described in detail later, set the number of characters to be indented and exdented.

The %P and %PX C-specs tell TFS that an indented or exdented paragraph starts with the next word. The current output line is broken (%BR) and the new paragraph is started when these C-specs are encountered.

Another feature of TFS is the automatic paragraphing facility. This feature, invoked by the %AP C-spec, makes any line of source text not in an %ASIS block whose first character is a space or tab the first line of a new indented paragraph. %AP is a toggle C-spec; that is, if automatic paragraphing is off, %AP engages it, and if automatic paragraphing is on, %AP disengages it. Hence, the following example demonstrates the use of %AP —

```
 %AP
 This is the first line
of a new paragraph. This paragraph
will be formatted as a paragraph
until another line beginning with a space
or tab character is encountered.
 This is the second paragraph.
 This is the third.
 %AP %REM Automatic paragraphing is now off.
```

HEADINGS, FOOTINGS, and CHAPTERS

The %HEAD C-spec permits the user to place a heading at the top of each page. This C-spec takes the form of '%HEAD text' on one line of the file. Only the %T, %R, %D (%DR), and %# C-specs may be placed in the text following the %HEAD C-spec, and all of the text following this C-spec to the end of the line in the file is used as the heading.

When a page eject occurs and %PGON and %HEAD are in effect, the first printed line contains the page number. This is followed by the number of blank lines specified by the line spacing C-spec (%SP n — see later) and the heading followed by one additional blank spaced line. For instance, if the output is double spaced, one blank line follows the line containing the page number and three blank lines (1 blank, 1 blank for the next normal line in spacing, and 1 blank to follow that line) follow the heading. If %PGON is not in effect, then the heading only will appear at the top of the page. The %FOOT C-spec is used to place a footer at the bottom of a page. It is structured like %HEAD, and the footer appears after the last text line on the page. At least three blank lines must be present in the bottom margin.

As mentioned above, the %T, %R, %D, and %# C-specs are the only C-specs which may appear in header and footer specifications. The %T C-spec is defined exactly as it normally is; it takes the form of '%T n', and its effect is to tabulate to the specified column. The %R and %D C-specs function as %R and %DR normally function; each is followed by the number of the register to display. %R displays the value of the specified register and increments it, while %D displays the value of the specified register and does not increment it. The %# C-spec is unique to header and footer entries. This C-spec produces the number of the current page (four digits). Hence, the normal page numbering scheme with the %PGON C-spec need not be used, and the user may create his own headers and footers to include the current page number as he desires. A typical footer may look like:

```
%FOOT Chapter %D 0 %T 60 Page %#
```

The chapter C-spec, %CH, is of the form '%CH n text', where 'n' is the chapter number 1-99 and 'text' is the chapter title. %CH forces a page eject, skips down 10 physical lines, centers the word 'CHAPTER' and the chapter number, skips down two blank spaced lines (3 physical lines if double spaced, 1 physical line if single spaced, 5 if triple, etc.), and centers the text of the chapter title. As with all centering, the next word after the %CH C-spec must be a C-spec which breaks the output line with a carriage return (see the section on centering). For example, such a C-spec may be %CR, %P, or %PX.

CENTERING

Centering is done explicitly in TFS by using the %C and %CB C-specs and implicitly by using the %CH C-spec. Centering always involves breaking the current line and starting a new line. The %C C-spec is of the form '%C text', where text is terminated by the end of the current line in the CP/M text file. When %C is encountered the output buffer is broken, and the centering is done on the next physical line of the printed output. Since spacing is done after a line is printed, centered lines in a single-spaced section of text will be on the next physical line and centered lines on double-spaced sections of text will be on the second physical line following the broken line.

The %CB (Center Block) C-spec is used to center a block of lines. Upon encountering %CB, the current output line is broken and centering begins with the word following the %CB. The lines are centered according to their physical composition in the source file; i.e., each line in the source file is centered by itself without the normal TFS function of searching for the next word regardless of source line boundaries. Centering continues until another %CB is encountered, at which time the current output line is centered and the following word is the next word to be processed in a normal TFS manner.

The normal TFS commands, including macros and underlining, are valid during centering, so centered text may be processed normally in addition to being centered. Note, however, that C-specs like %SKIP are also engaged and may impact on the centering process.

The following is an example of the two center C-specs of TFS —

```
%c This line will be centered
This line will not. %cb Centering starts now.
This line will be centered.
As will this one.
This, also. %cb This will not.
```

TABBING

Tabulation can be done explicitly by using the %T C-spec. This C-spec is of the form '%T n', where n is the number of the column to tab to. If the output line pointer is already beyond this column, no tabulation will be done and an error message will appear on the console.

NUMBERING and BACKSPACING

Two C-specs included at this time are %BS and %N. These C-specs give the user some additional control over the format of the output that is particularly advantageous.

%BS is the backspace C-spec. It has no arguments, and its function is to perform a backspace in the output line buffer. As each word is stored in the output line buffer, it is followed by one or two blanks. If it does not end in a terminating character like '.' (specified earlier), it is followed by one blank; if it ends in such a character it is followed by two blanks. %BS backs up the pointer which points to the next available character position in the buffer; hence, it erases a blank following the last word placed in the buffer.

%BS effectively concatenates the next word to be placed in the buffer with the last word placed in the buffer. This is particularly useful in cases where a C-spec which affects its arguments globally must be restrained.

As a case in point, %UL is such a C-spec. If the user wishes to underline a word, for instance, and terminate the word with a piece of punctuation which is not underlined, %BS makes this possible. For example,

```
%UL TFS %UL %BS .
```

makes the string '<u>TFS</u>.' possible.

Two problems with using %BS should be noted at this time. The first problem is that if the string to be concatenated to the word in the buffer would result in a line overflow, TFS will not permit the concatenation to occur. For example, if 'stand' is concatenated to 'under' and there are only two spaces left in the output line buffer (i.e., 'understand' will overflow the right margin by three spaces), concatenation will not occur and 'stand' will appear as the first word of the next line. Hence, as a general rule, it is best to use %BS to append a single character to the last word in the output buffer. One may safely append larger strings only if he is sure that an overflow will not occur.

The second problem is that %BS will not work if the output buffer is empty. No significant error will occur, but the concatenation to the desired word may not occur. Specifically, if the word to be appended to was the last word of the line just printed, then the backspace will be ineffective.

Numbering is the second item covered in this section. It was included primarily because backspacing often accompanies numbering in TFS, such as in the numbering of list items.

The %N C-spec is used to enable automatic numbering. TFS supplies a number buffer to the user; this buffer is initialized to 1 when TFS is first invoked and can be set by the %SETN C-spec (see later). Whenever %N is encountered the value in this buffer (1-99) is placed in the output buffer as a two-character word. If the value is between 1 and 9, the first character is a blank. After the word is placed in the output buffer, the value of the number buffer is incremented. Hence, successive occurances of %N result in successive numbers being placed in the output line, like '%SETN 1 %N %N %N' results in 1 2 3. This is particularly useful in producing numbered lists, where the user may wish to insert an element into a list at a later time and does not wish to manually renumber the lists in the CP/M text file. All lists in this manual are produced by using %N followed by a %BS and a ')' as the first words in an extended paragraph (see the list at the beginning of this chapter).

REGISTERS and REGISTER NUMBERING

In addition to the number buffer, TFS supplies 100 registers to the user. These registers are referenced by number, their numbers ranging from 0 to 99. They may be set, incremented, and displayed by the user at his convenience.

All registers are initialized to 1 when TFS is invoked and whenever the %CLRR C-spec (see later) is encountered. Two C-specs are available to display the contents of a register — %R and %DR. '%R n' displays the contents of register n as a two character number (blank filled) and increments the register, while '%DR n' displays the contents of the register and does not increment it.

%R and %DR functions are also available in headers and footers; the C-specs in this case are %R and %D.

Two other C-specs, %INCR and %SETR, are used to increment a register and set its value. These are discussed later.

COPYING

The last C-specs to be described in this chapter are %COPY, %ENDC, %LOOP, %ENDL, and %LEX. These C-specs allow the user to copy sections of the file up to 99 times. With these C-specs, all or selected sections of the CP/M text file may be duplicated in the output.

%COPY takes the form '%COPY n', where 'n' is the number of copies (1-99) to be made. The first word of the block to be copied is the first word of the line following the line containing the %COPY C-spec. For example,

```
%COPY 2 %P This
will be copied twice. %ENDC This once.
```

The entire file may be copied by placing %COPY after the last macro definition in the file (see the section on macros later) and by placing %ENDC as the last word in the file.

The %LOOP and %ENDL C-specs perform the same type of function as %COPY and %ENDC, but they establish an "infinite" loop. This loop can only be terminated by a loop exit C-spec, %LEX, or a TFS exit C-spec, %EXIT. The %LOOP and %ENDL C-specs find their value in applications where the user doesn't know how many copies he wants, the user wants more than 99 copies, and the user is generating his copies from a data file and he is terminating the process by placing a %LEX or an %EXIT C-spec in the data file. All words following %LEX in a Data File record are ignored.

%LOOP and %ENDL, like %COPY and %ENDC, bracket the text to be repeated. %LEX must appear somewhere within a loop bracketed by %LOOP and %ENDL; an error is given and processing is terminated if %LEX does not appear within such a loop.

Loops may not extend beyond the resident TFS source. That is, a loop may not be begun in one TFS source file, an append be performed, and the loop is terminated in the appended file. Any attempt to do so results in a TFS fatal error.

CHAPTER 3

Parameter Set C-specs

The Parameter Set C-specs are used to assign values to the various control settings used by TFS. These C-specs include:

1) Paragraph parameter C-specs, such as %PAR and %PARX,
2) Line parameter C-specs, such as %LMAR and %LLEN,
3) Page parameter C-specs, such as %LINE, %PGON, %PGOF, and %PNUM,
4) the Spacing parameter C-spec, %SP,
5) the significant blank character definition C-spec, %BLK,
6) and the N and R parameter C-specs, %SETN, %CLRR, %INCR, and %SETR.

All Parameter Set C-specs except %PNUM (see below) are effective immediately. For example, once %PAR is used, all subsequent paragraphs created by %P are affected; additionally, the current paragraph is also affected immediately.

The paragraph parameter C-specs set the indentation or exdentation number and the number of spaced lines to be placed between paragraphs. Both %PAR and %PARX have two numeric arguments — the first sets the indentation or exdentation and the second sets the number of spaced lines to be placed between paragraphs. As in most numeric parameters, these may take on the values from 1 to 99. For example, '%PAR 5 1' establishes an indentation of 5 spaces and the number of spaced lines to 1. If the output is double spaced, three blank lines (1 associated with the last line of the paragraph and 2 associated with the skipped line) are placed between each paragraph. Indented and exdented paragraphs are discussed in the previous chapter.

The %LMAR and %LLEN C-specs set the location of the left margin and the length of the output line. '%LMAR n' sets the left margin at 'n' characters right of the physical left end of the carriage; '%LLEN n' sets the length of the line to 'n' characters, starting at the current position of the left margin.

The effects of these C-specs are order-dependent to some extent. Since %LLEN sets the position of the right margin based upon its argument and the position of the left margin and %LMAR ignores the length of the line, if an %LMAR C-spec is executed after a %LLEN C-spec, the new line length is the difference between the old line length and the new left margin. For example, if '%LLEN 80 %LMAR 10' is encountered in the text, the new line length would be 70. However, if '%LMAR 10 %LLEN 80' is encountered, the new line length would be 80. The %LLEN C-spec adds its argument to the current position of the left margin.

The %LINE C-spec sets the format of the output page. %LINE has two arguments — the number of physical text lines on the output page and the number of physical lines on the output page. For instance, '%LINE 40 51' specifies that there are to be 40 physical text lines (including spacing) on a page and 51 physical lines on a page. Hence, when TFS is started and this instruction is encountered, TFS starts counting down from 40 with the line on which the user set the Top-of-Form, and, when it has counted 40 lines, it skips down 11 (51-40) for the next page.

The %PGON and %PGOF turn on and off the automatic page numbering facilities of TFS. %PGON has one argument, the column number from which the page numbers will be right-justified. For example, '%PGON 60' right-justifies the page numbers in column 60, so page 1 will print the 1 in column 60 and page 10 will print the 0 in column 60 and the 1 in 59. %PGOF turns off the automatic page numbering facility. Note that paging itself is always engaged with TFS.

%PNUM sets the number of the next page to be printed to the value of its argument. Unlike the other C-specs, %PNUM is not effective immediately — its value applies to the next page rather than the current page. Hence, '%PNUM 5 %PAGE' would result in the page supplied by the page eject (%PAGE) command having a number of 5. %PGON must be in effect for this C-spec to work.

%SP sets the spacing of the line. This C-spec is of the form '%SP n', where 'n' may take on values from 1-99. '%SP 2' sets double spacing, '%SP 1' sets single spacing, etc. '%SP 0' is not recommended since results are sometimes unpredictable.

%BLK defines the significant blank character. This C-spec is of the form '%BLK c', where 'c' is a single character. Once this C-spec is employed, whenever the character 'c' is encountered, a blank is printed in its place. This significant blank character may be redefined at any time. When TFS is first invoked, no significant blank character is defined.

%SETN n sets the value of the number buffer to the specified value (0-99). This C-spec is used to initialize the number buffer for subsequent uses of the %N C-spec (described earlier).

The final three C-specs in this chapter are %CLRR, %INCR, and %SETR. They manipulate the 100 registers of TFS without printing any values. %CLRR takes the simple form of '%CLRR', and this command sets the values of all the registers to 1. %INCR takes the form of '%INCR r', and it increments the value of register r. Finally, %SETR takes the form of '%SETR r n', and it sets the value of register r to n.

CHAPTER 4

Data File Manipulation C-specs

TFS supports two basic designations of files — TFS Source Files and TFS Data Files. Physically, there is no difference between these types of files; both may be created by CP/M in the same way, and they may be stored on disk and referenced by TFS. The difference between these two files is in their application. TFS Source Files are processed directly and normally by TFS. TFS Data Files, however, are processed indirectly by TFS; while processing a TFS Source File, elements from the TFS Data File are inserted into the output listing one record at a time, a record being defined as one line of a TFS Data File.

The TFS C-specs which are used to manipulate TFS Data Files are:

1) The %OPEN C-spec, which is used to open a Data File,
2) The %CLOS C-spec, which is used to close a Data File, and
3) The %READ C-spec, which is used to read a record from a Data File.

OPENING and CLOSING DATA FILES

Before a TFS Data File may be used, it must be opened. This function serves to locate the data file, initialize the resident buffer for it, and set a number of internal variables. This is done by using the %OPEN C-spec. This C-spec is of the form '%OPEN D:FILENAME.EXT'. Only one data file may be opened at one time. Both the drive specification and extension are optional. If omitted, the drive spec defaults to the currently logged-in drive and the extension defaults to blank.

Similarly, when a user has finished with one data file and wishes to use another, the %CLOS C-spec is used to close an opened Data File, thereby enabling the user to open another Data File. The %CLOS C-spec is simply of the form '%CLOS'.

Data Files may reside on any Disk Drive, and the user must take care not to change disks while a data file is in use. TFS makes no checks to see if this was done, and subsequent loads of the Data File buffers will come from the disk addresses of the data file on the original disk if this occurs. No prediction can be made as to the results.

READING TFS DATA FILES

Once a Data File has been opened, the user will want to read records from it and insert them into his output. This is done by using the $READ C-spec.

A record takes the form of a line in the data file. When a $READ is encountered, the internal TFS word pointer is saved, and it is then set to point at the first word of the next record in the data file. Words are then pulled from the data file until the end of the record (end of line) is reached. At this time, the original word pointer is restored and processing continues with the word following the $READ. An arbitrary number of words, including none at all, may exist in a record within the data file.

The records of a data file, then, are read and processed exactly as if they simply existed within the source file. This greatly extends the flexibility of TFS, since words within a record may be TFS commands. Only the $READ, $CLOS, $ASIS, $LOOP, $COPY, and $MAC and $ENDM commands (C-Specs) may not exist within a Data File, and TFS will generate a fatal error if one is encountered.

EXAMPLES of the USE of TFS DATA FILES

The applications of TFS Data Files, then, are enormous. With the ability to contain TFS commands, the power of a TFS Data File is greatly extended over that of conventional data files.

Two applications are of particular interest. The first is in creating a Data File which may be used to provide a common initialization of a TFS Source File. If several TFS Source Files require the same type of initialization, a TFS Data File may be created containing the proper statements, and it may be read by the Source Files in an infinite loop. The Data File, of course, would have $LEX as its last word.

Specifically, the following illustrates such an application:

```
TFS Source File              TFS Data File
---------------              -------------

$LOOP $READ $ENDL            $LMAR 0 $LLEN 85 $PGON 65
$REM continue source         $SETN 1 $LEX
```

In this example, the loop in the first line of the TFS Source File is executed, reading the words in the TFS Data File one word at a time. Each time the $READ is executed, a line from the data file is read and processed. This loop will execute twice, and, when the $LEX C-spec is encountered, the processing will continue in the source file on the second line.

The second application is in processing mailing lists. The following illustrates such an application:

```
TFS Source File                   TFS Data File
---------------                   -------------

%OPEN DATA1 %REM Open Data File
%LOOP %COPY 4 %READ                 Mr. James Jones
%CR %ENDC Dear %READ %BS ,          43 Ocean Avenue
%P Hello. How are you               Apt. 4
today?                              Sea Bright, NJ
%ASIS                               Jim
            Sincerely,              Mr. John Smith
            Your Friend             29 Queens Blvd
%ASIS
%PAGE %ENDL                         Sea Bright, NJ
%P This line is extra.              John
%CLOS                               %LEX
```

In this example, the TFS Data File is a mailing list, consisting of four lines of address and a fifth line containing the person's first name. Note that the Data File ends with a %LEX C-spec, and control is transferred to the line after the line containing %ENDL of the Source File when this is encountered.

The first line of the Source File reads the four lines of the address and inserts them into the output. The %CR on the next line of the Source File terminates each line read, and the %ENDC terminates the copy.

After the address is read, the word "Dear" is output at the beginning of the fifth line (note the last %CR before the %ENDC) followed by the name of the person from the fifth, tenth, etc., lines of the Data File. The internal pointer is backed up by the %BS C-spec, and a comma is placed immediately after the inserted name.

The body of the letter is then output, followed by the page eject in the Source File.

Here, then, are just two examples of the use of Data Files in TFS. As the user can see, the possibilities are enormous.

CHAPTER 5

Miscellaneous C-specs, including Macros

The following are other C-specs in TFS:

1) The environmental control C-specs, %SAV and %RES,
2) The pause C-spec, %PAUS,
3) The exit C-specs, %EXIT, %STOP, and %HALT,
4) The keyboard input C-spec, %KB,
5) The comment C-spec, %REM,
6) The append C-spec, %APND, and
7) The Macro C-specs, %MAC and %ENDM.

The %SAV and %RES C-specs are used to save and restore the TFS environment, respectively. The TFS environment consists of the following:

1) The number of lines to skip between paragraphs,
2) The centering flags,
3) The automatic paragraphing flag,
4) The right justification flag, which indicates if right justification is turned on,
5) The current page number,
6) The paging flag, which indicates if page numbering is currently turned on,
7) The indent and exdent counts,
8) The left margin setting,
9) The length of the output line,
10) The underline flag, which tells if underlining is engaged,
11) The heading flag, which tells if a heading is currently set,
12) The footer flag, which tells if a footer is currently set,
13) The line spacing, and
14) The current value of the number buffer.

Whenever %SAV is encountered, these values are saved in a reserve buffer. Their values remain unchanged. At this time, the user may change whichever values he wishes. When he wishes to restore the saved environment, he simply enters the %RES command.

The %PAUS C-spec is used to send a message to the user and suspend operation of TFS until the user responds by typing any key on the keyboard of the principal I/O device. It takes the form of %PAUS <text>, where <text> is terminated by the end of the current line. If the user types an <ESC> after the message is displayed, TFS will abort.

The %EXIT, %STOP, and %HALT C-specs are used to terminate interpretation of the TFS source immediately. They force a page eject and then return to the operating system. They may be used for many reasons, but a very good use of these C-specs is to terminate infinite loops and the corresponding output when reading a data file.

The %REM C-spec allows the user to enter a remark, or comment, into the file. The comment starts with the first character following the word '%REM' and continues to the end of the line in the file. The next line is then interpreted normally.

KEYBOARD INPUT

Keyboard Input is a very useful feature of TFS which is designed specifically for application with form letters or documents. Keyboard Input causes TFS to pause in its output processing and allow the user to type one line of text to be inserted into the output at the current position. All of the CP/M input line editor commands are in effect, and processing continues only after the user hits the Return key.

The %KB C-spec engages Keyboard Input and is of the form '%KB text'. Upon encountering this C-spec, TFS prints the text on the rest of the line after the C-spec (%KB) on the user's console, outputs a <CR> <LF>, types the word 'INPUT: ', and waits for the user to type something. The text typed by the user is then inserted into the document, and TFS continues processing.

The text typed by the user, as in all text processed by TFS, may contain embedded commands (C-specs) like %T, %C, etc. Only the %ASIS, %MAC, %ENDM, %COPY, and %LOOP C-specs may not be placed in the text typed by the user, and a TFS fatal error will result if this is done.

For example, a way to use %KB to input the address for a form letter is —

```
%LOOP
%KB Input the address and type %LEX when done
%CR %REM start a new line
%ENDL
```

APPENDING FILES

In some cases, the user may wish to load another file and continue formatting in the same environment as the previous file (i.e., he may wish to have the same line length, the same paragraph settings, etc.). The %APND C-spec was created to permit the user to do this. This command gives the TFS user the additional flexability of producing a report which spans over several files.

The %APND C-spec is of the form '%APND D:FILENAME.EXT'. Upon encountering this C-spec, TFS clears the local file space and loads the specified file. It then continues formatting at the first word of the loaded file. The drive specification and file extension are optional: if the drive spec is omitted, the current logged-in disk is default, and if the file extension is omitted, ".TFS" is the default.

All the environmental attributes of the previous file are preserved, but the macros need to be redefined. Hence, the %APND C-spec easily allows the user to chain several files into one formatted listing.

MACROs

Macros are essentially subroutines placed within the TFS formatting file. Each macro is of the form of the %MAC C-spec followed by the name of the macro; this name must be four characters or less -- any additional characters will be discarded. The first word following the macro name is the first word of the macro. The contents of the macro include all words following its name up to and including the %ENDM termination word.

Macros are not executed when they are defined. They are executed only when their names are referenced. For example, if the TFS file contained:

```
%MAC TFS %UL TFS %UL %BS , %ENDM
...
%TFS you see
```

the phrase '<u>TFS</u>,' would only be printed when the last line was encountered.

All macros must be defined before they are first referenced. TFS is a one-pass formatter, so the table of macro names is only formed as the macros are defined.

The nesting of macros is permitted. Macro definitions, however, may not be nested, but one macro may call another macro which in turn calls another. This type of nesting is permitted up to ten levels deep. An indirect recursion is not checked for by TFS, and such a situation could be disasterous. Up to twenty macros may be defined.

The best way to discover exactly what macros can do is to try them. The macro facility of TFS is indeed very powerful, and it can be of enormous value in creating formatted text.

CHAPTER 6

TFS User and Error Messages

There are two types of messages issued by TFS: (1) User Messages and (2) Error Messages. This chapter identifies and describes the meaning of all major TFS messages.

TFS USER MESSAGES

PLEASE INSERT NEXT PAGE

Insert the next page into the printer; this message appears when the '/P' (PAUSE after each page) option is used. When ready, the user types any character to continue or <ESC> or Ctrl-C to abort TFS and return to the operating system.

TYPE ANY CHAR WHEN READY, <ESC> OR CTRL-C TO ABORT

This appears when a %PAUS C-spec is used. Again, the user types any character other than <ESC> or Ctrl-C to continue and <ESC> or Ctrl-C to abort TFS and return to the operating system. This message appears when TFS is first engaged in order to give the user an opportunity to set the Top of Form on the printer.

NEW PAGE SETTING — PLEASE SET TOP OF FORM

A %LINE command was issued, resetting the page parameters. Please reset the top of form on the printer. Once top of form is set, type <ESC> or Ctrl-C to abort or any other key to continue.

++ TFS ++ LOAD:

TFS is in the process of opening the specified file as a source text file. This file was specified either in the TFS command line or by an %APND command.

++ TFS ++ OPEN:

TFS is in the process of loading the specified file as a data file. This file was specified in an %OPEN C-spec.

```
++ TFS ++  DISK OUTPUT SELECTED
  FILE NAME:  filename.DOC
DISK OUTPUT DRIVE (A/B/C/D)?
```

TFS has recognized the /D option and has specified the output file. The user is to select the disk drive (which must NOT be removed during output processing) to which the output file information will be sent.

LST: DISPLAY SET BY DEFAULT

TFS output is to go to the CP/M LST: device.

CON: DISPLAY SELECTED

TFS output is to go to the CP/M CON: device.

PAUSE SELECTED — LST: DISPLAY SET

The /P (Pause after each page) option was given in the command line. TFS output is to go to the CP/M LST: device.

INPUT:

A %KB (Keyboard Input) C-spec has been encountered. TFS is waiting for the user to type something (ending in a <CR>). CP/M input line editing is in effect (<DEL>, Ctrl-X, etc.).

TFS ERROR MESSAGES

$$DATA FILE NOT FOUND

The Data File named in an %OPEN C-spec was not found on the Logged-In or specified diskette drive.

$$DATA FILE NOT OPEN

A %READ was attempted when a Data File had not been opened.

$$EOF OF DATA

An attempt was made to read past the end of the opened Data File.

$$INVLD CMND IN KEYBOARD INPUT LINE

One of the restricted commands for the %KB C-spec was encountered in the input line just typed. See Chapter 5 for a list of these commands.

$$INVLD CMND IN DATA FILE

One of the restricted commands was encountered in the opened Data File. See Chapter 4 for a list of these commands.

$$LOOP ERR

An %ENDL or %ENDC was encountered without a preceeding %LOOP or %COPY. This will also occur if the %LOOP or %COPY is in one Source File and the %ENDL or %ENDC is in an appended Source File.

$$MACRO RET ERR

An error has occurred in the user's MACRO call structure. An %ENDM was encountered without a corresponding %MAC.

$$FILE NOT FOUND

The file referenced in an %APND C-spec was not found on the Logged-In or specified diskette drive.

$$TAB ERR

An attempt was made to tab to a column before the current column pointer.

$$ERROR — INVALID DISK DRIVE SPECIFIED

An invalid diskette drive specification (e.g., X:) appears in an %OPEN or %APND C-spec.

$$ERROR — TEXT BUFFER OVERFLOW — BREAK UP SOURCE FILE

The TFS source file is too large to completely fit in the TFS text file buffer. Break it into two parts and link these parts using the %APND C-spec.

$$INVLD NUM

An error exists in the TFS Source File after a command which expects a numeric constant. Such commands are %CH, %TP, etc.

$$XDENT ERR

A %PX was attempted, and the resulting starting location of the Xdented Paragraph was before the first column of the printer.

CHAPTER 7

A Sample TFS Source File

This chapter is designed to show the user specifically what a TFS source file looks like and how the various features of TFS may be employed to produce a document. As the user can see, the source file under discussion is this chapter itself. This first part of this chapter is a copy of the document after it has been formatted, and the last part of this chapter is a copy of the TFS source file.

As the user may note, three macros have been defined. These are used for generating a numbered itemized list. The macro %LIST initializes the list, the macro %ELST ends the list mode, and the macro %LE allows the user to enter an element into the list.

Macros, as one can see, provide a very useful tool for abbreviating the amount of text typed by the user. They also display the following advantages —

1. They can be made quite mnemonic and logical to use.

2. They can be used to "remember" the structures of the environments to switch to and from.

3. They can greatly improve the legibility of a TFS source file.

4. They are basically very flexable and useful in nature.

This chapter concludes the TFS manual. As the user can see, TFS, the <u>Text Formatting System</u>, is indeed a very useful, powerful, and flexable tool for text formatting, or word processing, applications.

The source listing of this chapter follows —

```
%llen 80 %par 5 1 %rem set line length to 80 cols and paragraphs to
%rem indent 5 columns and skip 1 line between each paragraph

%mac list %lmar 15 %llen 40 %setr 0 1 %endm
%rem  define the macro LIST to set the left margin to col 15, the line
%rem  length to 40 columns, and the value of register 0 to 1

%mac elst %lmar 0 %llen 80 %skip 2 %endm
%rem  define the macro ELST to reset the left margin and line length
%rem  and to skip 2 lines

%mac le %p %r 0 %bs . %endm
%rem  define the macro LE to start a new paragraph, display the value
%rem  in register 0, increment the value after displaying it, and
%rem  appending a period immediately after the number

%ch 7 A Sample TFS Source File
%rem  start a new chapter

%ap %rem  engage automatic paragraphing
%skip 2 %rem skip down 2 lines

        This chapter is designed to show the user specifically what
a TFS source file looks like and how the various features of TFS may
be employed to produce a document.  As the user can see, the source file
under discussion is this chapter itself.  This first part of this chapter
is a copy of the document after it has been formatted, and the last
part of this chapter is a copy of the TFS source file.
        As the user may note, three macros have been defined.  These
are used for generating a numbered itemized list.  The macro %%LIST
initializes the list, the macro %%ELST ends the list mode, and the
macro %%LE allows the user to enter an element into the list.
        Macros, as one can see, provide a very useful tool for
abbreviating the amount of text typed by the user.  They also display
the following advantages --
%list
%le They can be made quite mnemonic and logical to use.
%le They can be used to "remember" the structures of the
environments to switch to and from.
%le They can greatly improve the legibility of a TFS source file.
%le They are basically very flexable and useful in nature.
%elst
%skip 2
        This chapter concludes the TFS manual.  As the user can see,
TFS, the %ul Text Formatting System %ul %bs , is indeed a very useful,
powerful, and flexable tool for text formatting, or word processing,
applications.
        The source listing of this chapter follows --
```

CHAPTER 8

Summary of the TFS Commands

The TFS Command

The general form of the command to invoke the Text Formatting System (TFS) is --

```
TFS filename.ext /o
```

where '.ext' and '/o' are optional. If '.ext' is omitted, '.TFS' is assumed. Valid options are --

Option	Meaning
/Sn	Skip the specified number of pages
/V	View the output on the user's console
/P	Pause at the end of each page
/D	Send output to a disk file

Alphabetical Listing of the TFS Commands (C-Specs)

AP	CLRR	HEAD	NORJ	PX	SKIP
APND	COPY	INCR	OPEN	R	STOP
ASIS	CR	KB	P	READ	T
BLK	DR	LEX	PAGE	REM	TP
BR	ENDC	LINE	PAR	RES	UL
BS	ENDL	LLEN	PARX	RJ	
C	ENDM	LMAR	PAUS	SAV	
CB	EXIT	LOOP	PGOF	SETN	
CH	FOOT	MAC	PGON	SETR	
CLOS	HALT	N	PNUM	SP	

Functional Listing of TFS Commands (C-Specs)

Output Control

AP	DR r	P
ASIS	ENDC	PAGE
BR	ENDL	PX
BS	FOOT text	R r
C text	HEAD text	RJ
CB	LEX	SKIP n
CH n text	LOOP	T n
COPY n	N	TP n
CR	NORJ	UL

Parameter Set

BLK c	LMAR n	PNUM n
CLRR	PAR n m	SETN n
INCR r	PARX n m	SETR r n
LINE n m	PGOF	SP n
LLEN n	PGON n	

Data File Manipulation

CLOS	OPEN filename	READ

Miscellaneous

APND filename	KB text	RES
ENDM	MAC name	SAV
EXIT	PAUS text	STOP
HALT	REM text	

HELP File for TFS

```
Page Number  1 -- HELP File Listing:  TFS -- HELP FILE (TFS.HLP) FOR THE TEXT FORMATTING SYSTEM

TFS In General
Invoking TFS
Alphabetical Listing of the TFS C-specs
TFS C-specs Grouped by Class
TFS User Information Messages
TFS Error Messages
```

:TFS In General

The Text Formatting System, referred to as TFS, is a program which produces a modified printer listing of the contents of a CP/M text file. This listing is formatted; that is, it is modified according to control specifications contained within the file itself. TFS is a program which interprets these control specifications and produces the formatted listing.

These control specifications, hereafter referred to as C-specs, are commands of the form '%NAME', where '%' designates that a command name follows and 'NAME', a character string of up to four characters, is the name of the C-spec. The name of the C-spec may contain any combination of upper- and lower-case characters; all characters in a C-spec name are translated to upper-case.

In order to display a string starting with a '%', the string should be started with the escape sequence '%%'.

Refer to the TFS Manual, "TFS — The Text Formatting System: A Text Formatter Designed to Run Under the CP/M Operating System," for further information.

```
:Invoking TFS

     TFS is invoked by a conventional CP/M command line of the general
form --

               TFS d:filename.typ /o

where
          d: is optional and may specify a drive (A, B, C, or D)
          .typ is optional; .TFS is the default
          /o  is also optional,  and it specifies one or more  of  the
               following options --

                    /P  -- pause at the end of each page
                    /Sn -- skip the specified number of pages
                    /V  -- view the output on the user's console
                    /D -- send output to disk file 'filename.DOC'
                    /?  -- ask for general help (option list)
```

```
Page Number  4 -- HELP File Listing:  TFS -- HELP FILE (TFS.HLP) FOR THE TEXT FORMATTING SYSTEM

:Alphabetical Listing of the TFS C-specs

     The C-specs (embedded commands) recognized by TFS are --

          AP        CLRR      HEAD      NORJ      PX        SKIP
          APND      COPY      INCR      OPEN      R         STOP
          ASIS      CR        KB        P         READ      T
          BLK       DR        LEX       PAGE      REM       TP
          BR        ENDC      LINE      PAR       RES       UL
          BS        ENDL      LIEN      PARX      RJ
          C         ENDM      LMAR      PAUS      SAV
          CB        EXIT      LOOP      PGOF      SETN
          CH        FOOT      MAC       PGON      SETR
          CLOS      HALT      N         PNUM      SP
```

```
:TFS C-specs Grouped by Class

Paragraphing -- AP, P, PAR i l, PARX i l, PX
ASIS Mode -- ASIS
Line C-specs -- BR,  CR, LINE text physical, LLEN n, LMAR n, SKIP n, SP n
Headers and Footers -- FOOT text, HEAD text
Centering and Chapters -- C text, CB, CH n text
Paging -- PAGE, PGOF, PGON n, PNUM n, TP n
Data File -- CLOS, OPEN d:filename.typ, READ
Appending Files -- APND d:filename.typ
Halting TFS -- EXIT, HALT, STOP
Environment Save/Restore -- RES, SAV
Right Justification Control -- NORJ, RJ
Looping -- COPY n, ENDC, ENDL, LEX, LOOP
Backspacing, Tabulation, Underlining, Bold Face -- BS, T n, UL,
Register -- CLRR, DR r, INCR r, N, R r, SETN n, SETR r n
Macro Definition -- ENDM, MAC name
Output Pause -- PAUS text
Define Significant Blank -- BLK c
Keyboard Input -- KB text
Remark -- REM text
```

:TFS User Information Messages

The TFS User Information Messages are non-fatal information or request messages issued by TFS to the user. They serve to prompt the user for action or to inform the user as to what TFS is currently doing. Most of the User Information Messages are self-explanatory.
The following are the User Information Messages issued by TFS —

```
PLEASE INSERT NEXT PAGE
TYPE ANY CHAR WHEN READY, <ESC> OR CTRL-C TO ABORT
NEW PAGE SETTING — PLEASE SET TOP OF FORM
LST: DISPLAY SET BY DEFAULT
CON: DISPLAY SELECTED
PAUSE SELECTED — LST: DISPLAY SET
++ TFS ++ LOAD: filename.typ
++ TFS ++ OPEN: filename.typ
++ TFS ++  DISK OUTPUT SELECTED
  FILE NAME: filename.typ
DISK OUTPUT DRIVE (A/B/C/D)?
INPUT:
```

Refer to Chapter 6 of the TFS Manual for a complete explanation of these messages.

```
:TFS Error Messages

     All  TFS Fatal Error Messages are preceeded by $$.   Most of them
are  self-explanatory.  The  following are the Fatal  Error  Messages
issued by TFS --

DATA FILE NOT FOUND                 LOOP ERR
DATA FILE NOT OPEN                  MACRO RET ERR
EOF OF DATA                         FILE NOT FOUND
INVLD CMND IN KEYBOARD INPUT LINE   TAB ERR
INVLD CMND IN DATA FILE             INVLD NUM
INVALID DISK DRIVE SPECIFIED        TEXT BUFFER OVERFLOW  -- BREAK  UP
XDENT ERR                                SOURCE FILE

     Refer  to Chapter 6 of the TFS Manual for a complete  explanation
of these messages.
```

Source Listing of TFS

```
*  PROGRAM NAME:  TFS
*  AUTHOR:  RICHARD CONN
*  DATE:  14 JUL 80
*  VERSION:  3.0
*  PREVIOUS VERSION:  1.4 (1 SEP 79), 2.0 (22 JAN 80), 2.1 (22 APR 80)

*****************************************************************
*                                                               *
*  TFS -- FORMATS A CP/M TEXT FILE CONTAINING EMBEDDED TFS      *
*       COMMANDS AND OUTPUTS THE FORMATTED DOCUMENT ON EITHER   *
*       CON: OR LST:                                            *
*                                                               *
*  THE FORM OF THE TFS COMMAND IS:                              *
*       TFS X:FILENAME.EXT                                      *
*               /P                                              *
*               /S <NUMBER>                                     *
*               /V                                              *
*               /D                                              *
*  ONLY 'FILENAME' IS REQUIRED.                                 *
*                                                               *
*  THE OPTIONS FOR THE TFS COMMAND ARE:                         *
*       1) /P -- PAUSE AFTER PRINTING EACH PAGE.  LST: BECOMES  *
*          THE OUTPUT DEVICE.                                   *
*       2) /S -- SKIP THE SPECIFIED NUMBER OF PAGES AND START   *
*          PRINTING FROM THERE.                                 *
*       3) /V -- VIEW OUTPUT ON CON:.  IN THIS MODE, TFS        *
*          PAUSES AFTER EACH LINE AND WAITS FOR ANY KEY FROM    *
*          THE USER.  IF THE USER STRIKES THE <ESC> KEY, TFS    *
*          ABORTS; OTHERWISE, IT CONTINUES.                     *
*       4) /D -- SEND OUTPUT TO DISK                            *
*                                                               *
*  REFER TO THE TFS REFERENCE, USER'S, AND DESIGN MANUALS       *
*       FOR FURTHER DETAILS.                                    *
*                                                               *
*****************************************************************
*
```

```
        ORG     100H     ; TPA FOR CP/M
        JMP     TFS      ; START

*  USER-DEFAULT VALUES
DV1     DB      40       ; NUM OF LINES OF TEXT PER PAGE
DV2     DB      51-40    ; NUM OF REMAINING LINES PER PAGE
DV3     DB      5        ; DEFAULT PARAGRAPH INDENT VALUE
DV4     DB      75       ; DEFAULT LINE LENGTH

*  START OF TFS
TFS     LDA     FCB+9    ; EXTENSION?
        CPI     ' '
        JNZ     TFS0
*  SET UP DEFAULT EXTENSION
        LXI     H,DEXT+8         ; MAKE 'TFS' THE DEFAULT EXT
        LXI     D,FCB+9
        MVI     C,3      ; 3 CHARS
        CALL    LCIR
*  SET UP I/O AND STATUS ADDRESSES
TFS0    LDA     BOOT+2   ; GET HIGH BYTE OF BIOS VECTOR
        MOV     H,A      ; ... IN H
        MVI     L,6      ; CONSOLE STATUS ADR
        SHLD    STADR
        MVI     L,9      ; CONSOLE INPUT ADR
        SHLD    INADR
        MVI     L,0CH    ; CONSOLE OUTPUT ADR
        SHLD    OUTADR
        MVI     L,0FH    ; PRINTER OUTPUT ADR
        SHLD    PRADR
*  GET VIEW OPTION IN OFLAG AND PAGE SKIP COUNT IN SKFLG
        XRA     A        ; A=0
        STA     DOUT     ; SET DISK OUTPUT FLAG TO OFF
        STA     OFLAG    ; SET OPTION TO NULL
        LXI     H,0      ; SET SKIP COUNT TO ZERO
        SHLD    SKFLG
        LXI     H,BUFF   ; SCAN COMMAND LINE FOR OPTIONS
        MOV     A,M      ; GET BYTE COUNT
        INX     H        ; PT TO FIRST CHAR
        PUSH    H        ; SAVE PTR
        CALL    ADR      ; PT TO LAST CHAR
        MVI     M,0      ; SET EOL CHAR
        POP     H         ; PT TO FIRST CHAR OF LINE
        PUSH    H         ; SAVE PTR
*  OBTAIN SPEC FOR CURRENT DRIVE
        MVI     C,25      ; INTERROGATE DRIVE NUMBER
        CALL    BDOS
        ADI     'A'       ; CONVERT TO LETTER
        STA     CUR$DRV   ; CURRENT DRIVE SPEC
        POP     H         ; GET PTR
        PUSH    H         ; SAVE PTR
*  SCAN FOR DRIVE SPECIFICATION
TFSDRV  MOV     A,M       ; GET BYTE
        INX     H         ; PT TO NEXT
        ORA     A         ; 0 MEANS EOL
        JZ      TFSDRD
        CPI     ':'       ; COLON MEANS WE FOUND ONE
        JNZ     TFSDRV    ; CONT IF NOT
        DCX     H         ; PT TO DRIVE SPEC
        DCX     H
        MOV     A,M       ; GET DRIVE LETTER
        STA     CUR$DRV   ; LOG IN DRIVE SPECIFIED BY CHAR IN A
TFSDRD  POP     H         ; GET PTR TO 1ST CHAR
        CALL    ZPRR
        DB      'TFS V3.0',0DH,0AH
        DB      '  AT ANY TIME, TYPE EITHER <ESC> OR CTRL-C TO ABORT',0
*  CHECK FOR OPTION -- DELIMITED BY /
        CALL    ZPRR
        DB      'LST: DISPLAY SET BY DEFAULT',0
TFSO1   MOV     A,M       ; GET CHAR
        ORA     A         ; 0 MEANS EOL
        JZ      TFS$STRT          ; DONE W/SCAN
        INX     H         ; PT TO NEXT
        CPI     '/'       ; OPTION FLAG
        JNZ     TFSO1
        MOV     A,M       ; GET NEXT CHAR (OPTION MNEMONIC)
        CPI     'V'       ; VIEW?
        JZ      TFSOV
        CPI     'P'       ; PAUSE?
        JZ      TFSOP
        CPI     'S'       ; SKIP?
        JZ      TFSOS
        CPI     'D'       ; DISK OUTPUT?
        JZ      TFSOD
*  INVALID OPTION -- ERROR MESSAGE
```

```
        CALL    ZCR

        CALL    ZPRR
        DB      0DH,0AH
        DB      'TEXT FORMATTING SYSTEM COMMAND LINE IS —',0DH,0AH
        DB      '     TFS [X:]FILENAME[.EXT] [/O1][/O2][/O3]',0DH,0AH
        DB      'NOTE THAT DRIVE SPECIFICATION IS OPTIONAL — LOGGED IN '
        DB      'DRIVE IS DEFAULT',0DH,0AH
        DB      'EXTENSION IS OPTIONAL — ".TFS." IS DEFAULT',0DH,0AH
        DB      'USER OPTIONS DEFAULT TO OUTPUT ON LST:, NO PAUSE, NO SKIP'
        DB      0DH,0AH,0DH,0AH
        DB      'VALID TFS OPTIONS ARE —',0DH,0AH
        DB      ' /P = PAUSE AFTER PRINTING EACH PAGE',0DH,0AH
        DB      ' /S NUM = SKIP "NUM" PAGES AND START PRINTING',0DH,0AH
        DB      ' /V = VIEW OUTPUT ON CON:; DELAY AFTER EACH LINE',0DH,0AH
        DB      ' /D = SEND OUTPUT TO DISK',0DH,0AH
        DB      0

        JMP     ZEOR

*  CHECK FOR VIEW OPTION
TFSOV   STA     OFLAG   ; SET OPTION FOR VIEWING ON CRT
        CALL    ZPRR    ; PRINT INFO
        DB      'CON: DISPLAY SELECTED',0
        JMP     TFSO1

*  CHECK FOR PAUSE OPTION
TFSOP   STA     OFLAG   ; SET OPTION FOR PAUSING ON PRINTOUT
        CALL    ZPRR
        DB      'PAUSE SELECTED — LST: DISPLAY SET',0
        JMP     TFSO1

*  EXTRACT PAGE NUMBER FOR SKIP OPTION
TFSOS   LXI     D,0     ; SET ACCUMULATED NUMBER TO ZERO
TFSOP2  INX     H       ; PT TO NEXT DIGIT
        MOV     A,M     ; GET DIGIT
        SUI     '0'     ; CONVERT TO BINARY, IF POSSIBLE
        JC      TFSOP4  ; DONE IF ERROR
        CPI     10      ; MUST BE LESS THAN 10
        JNC     TFSOP4
        MOV     B,A     ; VALUE IN B
        MVI     C,9     ; MULT DE BY 10
        PUSH    H       ; SAVE PTR TO CHAR
        MOV     H,D     ; PUT DE INTO HL
        MOV     L,E
TFSOP3  DAD     D       ; HL=HL+DE
        DCR     C
        JNZ     TFSOP3
        MOV     A,B     ; GET VALUE
        ADD     L       ; ADD TO NEW NUMBER
        MOV     L,A
        MOV     A,H
        ACI     0
        MOV     H,A
        XCHG            ; DE HAS ACCUMULATED NUMBER
        POP     H       ; RESTORE PTR TO CURRENT CHAR
        JMP     TFSOP2
TFSOP4  XCHG            ; HL HAS ACCUMULATED NUMBER
        SHLD    SKFLG   ; SET SKIP FLAG
        XCHG            ; HL PTS TO "ERROR" CHAR
        JMP     TFSO1

*  SET DISK OUTPUT
TFSOD   MVI     A,0FFH  ; ENABLE DISK OUTPUT
        STA     DOUT
        LXI     H,FCB+1 ; PT TO FILE NAME
        LXI     D,OUT$FILE+1    ; PT TO OUTPUT FILE SPEC
        MVI     C,8
        CALL    LCIR    ; COPY FILE NAME
        CALL    ZPRR
        DB      0DH,0AH,'++ TFS ++  DISK OUTPUT SELECTED'
        DB      0DH,0AH,'  FILE NAME: ',0
        LXI     H,OUT$FILE+1    ; PRINT FILE NAME
        CALL    PRFN    ; PRINT FILE NAME
        CALL    ZPRR
        DB      0DH,0AH,'DISK OUTPUT DRIVE (A/B/C/D)? ',0
        CALL    ZIN     ; GET RESPONSE
        CALL    CAPS    ; CAPITALIZE
        STA     OUT$DRV ; SET OUTPUT DRIVE
        CALL    ZOUT    ; PRINT CHAR
        SUI     'A'     ; OK?
        CPI     4
        JNC     TFSOD$ERR
        JMP     TFSO1
TFSOD$ERR:
        CALL    ZPRR
        DB      0DH,0AH,'INVALID DRIVE SPECIFICATION -- REENTER',0
        JMP     TFSOD
```

```
*
*  INITIALIZE BUFFERS
*
TFS$STRT:
        CALL    ZCR     ; NEW LINE
        LDA     CUR$DRV ; LOG IN CURRENT DRIVE
        CALL    SETDRV
        LDA     DOUT    ; GET OUTPUT INDICATOR
        ORA     A       ; 0=NO
        JZ      TFS$STRT1
        LXI     D,OUT$FILE      ; ESTABLISH OUTPUT FILE
        CALL    F$OPEN
TFS$STRT1:
        CALL    CLOSE1  ; CONTINUE INITIALIZATION
        CALL    CLRR
        CALL    LOAD    ; LOAD FILE SPECIFIED IN FCB
        CALL    PAUSM
        CALL    ZCR
        LXI     H,LBUF
        SHLD    CPOS
        CALL    CLERL
        LDA     DV4     ; SET LINE LENGTHS TO DEFAULT
        STA     BUFLEN
        STA     LNLEN
        STA     RJFLG
        LXI     H,ZBOF  ; CHECK FOR NULL FILE
        MOV     A,M
        CPI     EOF
        RZ
        CALL    LPCLR
        XRA     A       ; A=0; SET FLAGS
        STA     RDFLG1
        STA     APFLG
        STA     NCOPY
        STA     ULINE
        STA     LMAR
        STA     PGFLAG
        STA     ATAB
        STA     MTAB
        STA     HDFLG
        STA     FTFLG
        STA     PSKIP
        STA     PSKIPX
        STA     CENFL
        STA     CENBFL
        STA     PGCNT+1
        INR     A               ; A=1; SET FLAGS
        STA     BLK
        STA     SPCNT
        STA     PGCNT
        STA     NO
        INR     A               ; A=2; SET FLAGS
        STA     NULLS
        LDA     DV3             ; SET PARAGRAPH INDENTS
        STA     IDNT
        STA     XDNT
        LDA     DV1             ; NUMBER OF LINES OF TEXT PER PAGE
        STA     NL1
        STA     NL1BF
        LDA     DV2             ; NUMBER OF LINES LEFT ON PAGE
        STA     NL2
*
```

```
*  START NEW OUTPUT LINE
TFS1    XRA     A       ; SET CHAR COUNT
        STA     NCHARS
*  MAJOR WORD-ACCUMULATION LOOP
LLOOP   LXI     SP,STACK        ; SET STACK POINTER
        CALL    ZINK
        CALL    SWRD    ; GET WRD
        LDA     NCHARS
        ORA     A
        JZ      PWRD    ; FORCE CHAR IF BUF EMPTY
        ADD     C
        MOV     B,A     ; SAVE COUNT IN B
        LDA     BUFLEN  ; CHECK TO SEE IF IT FITS
        CMP     B
        JNC     PWRD
        PUSH    H
        CALL    CTEST   ; TEST FOR CENTERING AND CENTER IF SET
        CALL    OUTLNE  ; PRINT LINE IF CENTERING DIDN'T OCCUR
        CALL    BREK1   ; RESET OUTPUT LINE
        POP     H       ; RESTORE PTR
*  PLACE WORD IN OUTPUT LINE BUFFER; SET BIT 7 TO UNDERLINE
PWRD    PUSH    H
        PUSH    D
        PUSH    B
        LHLD    CPOS    ; H&L PT TO NEXT WRD SPACE
        LDA     ULINE   ; GET UL
        MOV     C,A
        LXI     D,WBUF-1
        LDAX    D       ; GET CHAR COUNT
        MOV     B,A
        INX     D
        LDA     NCHARS  ; UPDATE LINE CHAR COUNT
        ADD     B
        INR     A       ; ADD 1 FOR <SP> AFTER
        STA     NCHARS
PWRDL   LDAX    D       ; GET & STORE CHAR
        ORA     C       ; UL
        MOV     M,A
        INX     D
        INX     H
        DCR     B
        JNZ     PWRDL
        MVI     M,' '   ; PUT <SP> IN BUFFER
        INX     H       ; NEW CURRENT POSITION
*  CHECK FOR SPECIAL CHAR FOLLOWING WORD
        DCX     D       ; PT TO LAST CHAR OF PREVIOUS WORD
        LDAX    D       ; CHECK FOR END
        CPI     '.'
        JZ      EXSP
        CPI     '?'
        JZ      EXSP
        CPI     '!'
        JZ      EXSP
        CPI     ':'
        JNZ     PWRDLO
*  PLACE 2ND SPACE AFTER SPECIAL CHAR
EXSP    MVI     M,' '   ; EXTRA <SP>
        INX     H
        LDA     NCHARS  ; INCR CHAR COUNT
        INR     A
        STA     NCHARS
PWRDLO  SHLD    CPOS
        POP     B
        POP     D
        POP     H
        JMP     LLOOP
*
```

```
*  CLEAR OUTPUT LINE BUFFER
CLERL   PUSH    H          ; CLEAR LBUF
        LXI     H,LBUF
        MVI     B,140
CLERL1  MVI     M,' '
        INX     H
        DCR     B
        JNZ     CLERL1
        POP     H
        RET
*  LOOK FOR NEXT WORD; IF EOL ENCOUNTERED, SKIP TO NEXT LINE;
*    IF AUTOPARAGRAPHING ENGAGED, PARAGRAPH IF 1ST CHAR OF LINE IS <SP>
*  ON EXIT, FWRD PTS TO NEXT WORD W/HL
FWRD    MOV     A,M        ; GET CHAR
        CPI     0DH        ; GET TO NEXT LINE IF <CR>
        JZ      FWRD0
        CPI     ' '+1      ; SKIP <SP> OR LESS
        RNC
        INX     H
        JMP     FWRD
*  <CR> ENCOUNTERED -- CENTER IF CENTERING IN PROGRESS
FWRD0   PUSH    H          ; SAVE PTR TO <CR>
        CALL    CTEST      ; TEST FOR CENTERING AND CENTER IF SET
        POP     H          ; RESTORE PTR TO <CR>
*  <CR> ENCOUNTERED -- IF IN INPUT LINE, RETURN TO DOCUMENT BODY
        LDA     RDFLG1     ; READ FROM INPUT LINE?
        ORA     A
        JZ      FWRD01     ; CONT IF NOT
        XRA     A          ; RESET INPUT LINE READ FLAG
        STA     RDFLG1
        LHLD    RTEMP1     ; RESTORE SOURCE FILE PTR
        JMP     FWRD       ; FIND NEXT WORD
*  <CR> ENCOUNTERED -- IF IN DATA FILE, RETURN TO DOCUMENT BODY
FWRD01  LDA     RDFLG      ; READ FROM DATA FILE?
        ORA     A
        JZ      FWRD1      ; CONT IF NOT
        INX     H          ; PT TO 1ST CHAR OF NEXT LINE
        INX     H
        SHLD    DPTR
        XRA     A          ; RESET RDFLAG
        STA     RDFLG
        LHLD    RTEMP      ; RESTORE SOURCE FILE PTR
        JMP     FWRD    ; FIND NEXT WORD
*  SKIP OVER <CR> <LF>, CHECK FOR EOF, AND CHECK FOR AUTO PAR & IMPLEMENT
FWRD1   INX     H       ; SKIP <CR>
        INX     H       ; SKIP <LF>
        MOV     A,M     ; CHECK FOR EOF
        CPI     EOF
        JZ      DONE
*  IF ANOTHER <CR>, SKIP ALSO
        CPI     0DH     ; <CR>?
        JZ      FWRD1
*  AUTOMATIC PARAGRAPHING — SIMPLE, ISN'T IT?
        LDA     APFLG   ; AUTOMATIC PAR ENGAGED?
        ORA     A       ; 0=NO
        JZ      FWRD
        MOV     A,M     ; GET 1ST CHAR OF LINE
        CPI     ' '     ; ENGAGE %P IF LEADING <SP>
        JZ      FWRD2
        CPI     9       ; ENGAGE %P IF LEADING <TAB>
        RNZ
*  FORCE PARAGRAPH
FWRD2   CALL    PAR     ; %P EQUIVALENT
        JMP     FWRD    ; FIND PROPER WORD
*  SCAN COMMAND TABLE PTED TO BY DE (CMND COUNT BYTE IS PTED TO) FOR
*    CMND PTED TO BY HL; ON EXIT, DE PTS TO ADR & HL PTS TO NEXT WORD
*    IF FOUND, RET W/NZ — IF NOT FOUND, RET W/Z
SCAN    LDAX    D       ; GET CMND CNT
        MOV     B,A
        INX     D
        ORA     A       ; ABORT IF NONE
        RZ
*  START SCANNING
SCAN0   PUSH    H       ; SAVE PTR TO CMND
        PUSH    D       ; SAVE PTR TO TABLE ENTRY
        MVI     C,CCNT  ; # CHARS IN CMND
        XCHG
*  EXTRACT COMMAND, CAPITALIZE, AND COMPARE
SCAN1   LDAX    D       ; COMPARE
        CALL    CAPS    ; CAPITALIZE CMND
        CMP     M
        JNZ     SCAN3
        MOV     A,M
        CPI     ' '     ; DONE IF <SP>
        JZ      SCAN2
        INX     H
        INX     D
        DCR     C
        JNZ     SCAN1
* SCAN SUCCEEDED — GET ADR OF COMMAND IN DE
SCAN2   XCHG
SCAN21  SHLD    CNEXT   ; SAVE PTR TO NEXT CHAR
        POP     H       ; PT TO ADR
        MVI     A,CCNT
        CALL    ADR     ; COMPUTE ADR
        MOV     E,M     ; DE PT TO ADR
        INX     H
        MOV     D,M
        POP     H       ; CLEAR STACK
        LHLD    CNEXT   ; HL PT TO NEXT CHAR
        MVI     A,1     ; NZ MEANS FOUND
        ORA     A
        RET
* SCAN CHECK — <SP> MATCHES <CR>
SCAN3   XCHG
        LDAX    D       ; GET TABLE CHAR
        CPI     ' '
        JNZ     SCAN3A
        MOV     A,M
        CPI     0DH
        JZ      SCAN21  ; MATCH
* SCAN FAILED — PT TO NEXT TABLE ENTRY
SCAN3A  INX     D       ; PT TO ADR
        DCR     C
        JNZ     SCAN3A
        INX     D       ; SKIP ADR
        INX     D
        POP     H       ; CLEAR STACK
        POP     H       ; PT TO SEARCH STR
        DCR     B
        JNZ     SCAN0
        DCX     H       ; PT TO %
        XRA     A       ; Z MEANS NOT FOUND
        RET
* SEE IF WORD STARTS W/% -- IF SO, IT MAY BE A COMMAND
CKWRD   MOV     A,M     ; CMNDS START W/%
        CPI     CCHAR
        RNZ
        INX     H        ; PT TO CMND NAME
*  '%%' IS ESCAPE SEQUENCE — PRINT AS '%'
        MOV     A,M      ; CHECK FOR ESC SEQ
        CPI     CCHAR    ; '%%'=CCHAR TO PRINT
        RZ
        PUSH    H        ; SAVE PTR
*  SCAN FOR MACRO NAME FIRST
        LXI     D,MTAB   ; CHECK FOR MACRO
        CALL    SCAN
        JZ      CMND     ; CHECK FOR CMND IF NOT FOUND
        MOV     B,H      ; SAVE PTR TO NEXT CHAR
        MOV     C,L
        POP     H        ; CLEAR STACK
        LXI     H,ATAB   ; STORE IN ADR TABLE
        MOV     A,M      ; GET NEXT LOC DISP IN A
        INR     M        ; NEW CNT
        ADD     A        ; DOUBLE IT
        INX     H        ; PT TO TABLE
        CALL    ADR      ; COMPUTE SAVE ADR
        MOV     M,C      ; STORE RET ADR
        INX     H
        MOV     M,B
        MOV     H,D      ; HL PT TO NEXT WORD (1ST IN MAC)
        MOV     L,E
        JMP     CKRET
*  CHECK FOR COMMAND
CMND    LXI     D,CTAB   ; CHECK FOR CMND
        POP     H        ; GET PTR
        CALL    SCAN     ; CHECK TABLE
        RZ               ; RETURN IF NOT FOUND
        LXI     B,CKRET  ; SET UP RET ADR
        PUSH    B
        PUSH    D        ; RUN FROM STACK
        RET              ; HL PTS TO NEXT CHAR IN FILE
*  RETURN HERE AFTER COMMAND/MACRO LOCATED
CKRET   POP     D        ; CLEAR STACK
*  SEARCH FOR NEXT WORD; IF COMMAND/MACRO, EXECUTE IT AND SEARCH AGAIN;
*    IF NOT COMMAND/MACRO, LOAD IT INTO WBUF; ON EXIT, HL PTS TO WORD AFTER
*    FOUND WORD
SWRD    CALL    FWRD     ; HL PTS TO NEXT CHAR
        CALL    CKWRD    ; CHECK FOR TFS COMMAND
SWRD0   LXI     D,WBUF
        MVI     C,0      ; INIT CHAR COUNT
```

```
SWRDL   MOV     A,M
        STAX    D       ; PUT IN BUFFER
        CPI     21H     ; STOP IF < 21H
        JC      SWRD1
        INX     D
        INX     H
        INR     C       ; INCR COUNT
        JMP     SWRDL
SWRD1   MVI     A,' '   ; STORE <SP>
        STAX    D
        MOV     A,C     ; STORE CHAR COUNT
        STA     WBUF-1
        RET
*  END OF PROCESSING
DONE    CALL    PAGE    ; EJECT PAGE
        JMP     ZEOR
*
```

```
*  OUTPUT LINE IN LBUF; RIGHT JUSTIFY IF DESIRED
OUTLN   LDA     NCHARS  ; GET CHAR CNT
        ORA     A       ; NONE?
        RZ
        MOV     B,A
*  IF LINE IN LBUF BEYOND LIMITS SPECIFIED, PRINT IT W/O JUSTIFICATION
        LDA     BUFLEN  ; CHECK FOR WITHIN LIMITS
        SUB     B
        CPI     CLIM    ; SEE IF MORE THAN CLIM CHARS
        JNC     PRINT   ; PRINT IF SO
*  OUTPUT LINE
OUTLNE  LDA     NCHARS  ; LINE PRESENT?
        ORA     A
        RZ
*  CHECK FOR RIGHT JUSTIFICATION, AND PRINT IF NOT
        LDA     RJFLG   ; RJ?
        ORA     A       ; ZERO MEANS NO
        JZ      PRINT
*  RIGHT JUSTIFY LINE
        LDA     NCHARS  ; GET CHAR CNT (ENTRY POINT)
        MOV     B,A
        LXI     H,LBUF
        CALL    ADR     ; HL PT TO END OF STR
        DCX     H
ENDL    MOV     A,M     ; FIND LAST NON-BLANK CHAR
        CPI     ' '
        JNZ     ENDL1
        DCX     H
        DCR     B
        JMP     ENDL
ENDL1   MOV     A,B     ; NEW CHAR CNT
        STA     NCHARS
        SHLD    CPOS    ; STORE CURR POS
        LDA     BUFLEN
        SUB     B       ; CHECK FOR WITHIN BOUNDS
        JC      PRINT
        JZ      PRINT
        MOV     B,A     ; EXTRA <SP> CNT IN B
        MVI     C,0
        LXI     D,LBUF  ; COUNT # <SP> IN LINE
CNTLP   LDAX    D
        CPI     ' '
        JNZ     CNTL0
        INR     C
CNTL0   INX     D
        MOV     A,D      ; END OF LINE?
        CMP     H
        JNZ     CNTLP
        MOV     A,E
        CMP     L
        JNZ     CNTLP
        MOV     A,C      ; COMPUTE # EXTRA <SP> BET EA CHAR
        STA     VLOOP    ; # EXTRA <SP>'S
        MOV     A,B
        MVI     D,0
SPLP    SUB     C
        JC      SPLP1
        INR     D        ; INCR  COUNT
        JMP     SPLP     ; CONT
SPLP1   ADD     C
        MOV     E,A      ; D=# CHRS BET EA, E=# EXTRA CHRS
        MOV     A,D      ; CHECK FOR NO EXTRA <SP>
        ORA     E
        JZ      PRINT
        MOV     B,D      ; # CHARS BET EACH WORD
        MOV     C,E      ; # EXTRA CHARS
        LHLD    CPOS
        LXI     D,LBUF
        LDA     BUFLEN
        XCHG
        CALL    ADR
        XCHG
        DCX     D        ; DE PT END LBUF, HL PT END CUR LN
FLOOP   MOV     A,M      ; GET CHAR
        STAX    D        ; STORE CHAR
        DCX     H
        DCX     D
        CPI     ' '      ; CHECK FOR <SP>
        JNZ     FLOOP
        MOV     A,B      ; LOOP FOR B CHARS
        ORA     A
        JZ      FLP1
        STA     TEMP
        MVI     A,' '    ; STORE <SP>
FLP0    STAX    D        ; STORE EXTRA <SP>
```

```
        DCX     D
        DCR     B
        JNZ     FLP0
        LDA     TEMP    ; RESTORE B
        MOV     B,A
FLP1    MOV     A,C
        ORA     A       ; CHECK IF DONE WITH EXTRA
        JZ      FLP2
        MVI     A,' '   ; STORE EXTRA <SP>
        STAX    D
        DCX     D
        DCR     C
FLP2    LDA     VLOOP   ; COUNT DOWN
        DCR     A
        STA     VLOOP
        JNZ     FLOOP
        LDA     BUFLEN  ; LINE FILLED
        STA     NCHARS  ; SET CHAR CNT
*  PRINT LINE CONTAINED IN LBUF ON PROPER OUTPUT DEV (CON: IF /V OPTION,
*    LST: OTHERWISE)
PRINT   LDA     NCHARS
        MOV     B,A     ; STORE CHAR COUNT IN B
        LXI     H,LBUF
        XRA     A       ; TURN OFF ULFLAG
        STA     ULFLG
PRINL   MOV     A,M     ; GET CHAR
        CALL    POUT    ; PRINT
        ANI     80H     ; CHECK FOR UL
        JZ      PRINL1
        MOV     A,M     ; CHECK SPECIAL <SP>
        CPI     0A0H
        JZ      PRINL1
        MVI     A,1     ; SET UL FLAG
        STA     ULFLG
PRINL1  INX     H
        DCR     B
        JNZ     PRINL
*  CHECK FOR UNDERLINING
        LDA     ULFLG   ; CHECK FOR UL
        ORA     A
        JZ      CRLF
*  UNDERLINING TO BE DONE — DO IT
        LDA     OFLAG   ; CHECK FOR CRT VIEW — PAUSE IF SO
        CPI     'V'     ; VIEW?
        JNZ     ULLP
        CALL    SKCHEK  ; IF SKIPPING, CONTINUE
        JNZ     ULLP
        CALL    ZESC    ; ESCAPE
ULLP    LXI     H,LBUF  ; DO UL
        LDA     NCHARS  ; GET NO CHARS
        PUSH    PSW     ; SAVE CHAR CNT
*  BACKSPACE TO BEGINNING OF LINE
        MOV     B,A
        MVI     A,8     ; <BS>
ULLPBS  CALL    POUT    ; PRINT <BS>
        DCR     B       ; COUNT DOWN
        JNZ     ULLPBS
        POP     PSW     ; GET CHAR CNT
*  ADVANCE FORWARD, UNDERLINING AS YOU GO
        MOV     B,A
        PUSH    H
ULLP0   MOV     A,M     ; GET CHAR
        INX     H
        ANI     80H
        JZ      ULLPC
        MOV     C,B     ; COUNT IN C
ULLPC   DCR     B
        JNZ     ULLP0
        LDA     NCHARS
        SUB     C
        INR     A
        MOV     B,A     ; ACTUAL COUNT IN B
        POP     H       ; RESTORE PTR
ULLP1   MOV     A,M     ; GET CHAR
        INX     H
        CPI     0A0H    ; CHECK OF UL <SP>
        JZ      ULLP2
        ANI     80H     ; CHECK FOR UL
        JZ      ULLP2
        MVI     A,5FH   ; UL
        JMP     ULLPT
ULLP2   MVI     A,' '   ; <SP>
ULLPT   CALL    POUT
        DCR     B
        JNZ     ULLP1
*  <CR> <LF>, MULTIPLE SPACING, AND PAGE IF REQUIRED
```

```
CRLF    CALL    CR
        LDA     SPCNT   ; SPACING
        ORA     A
        RZ
*  SPACE DOWN APPROPRIATELY
        MOV     C,A     ; CNT IN C
CRLF0   CALL    LF
        LDA     NL1BF   ; GET LINE CNT
        DCR     A
        STA     NL1BF
        JZ      CRLF1
        DCR     C
        RZ
        JMP     CRLF0
*  PAGE
CRLF1   LDA     NL2     ; SPACE OUT PAGE
        MOV     B,A
*  PRINT FOOTER IF REQUESTED
        LDA     FTFLG   ; FOOTER?
        ORA     A
        JZ      SPPGL
        DCR     B
        CALL    LF
        PUSH    B
        PUSH    H
        CALL    WBSAV
        CALL    PFOOT
        CALL    WBRES
        CALL    CR
        POP     H
        POP     B
*  PRINT PAGE NUMBER IF REQUESTED
SPPGL   LDA     PGFLAG  ; PAGE?
        ORA     A
        JZ      SPPGL0
        DCR     B
        CALL    LF
        PUSH    B
        LDA     LNLEN   ; PUT '##'
        SUI     2       ; TWO IN
        MOV     B,A
PGSPL   MVI     A,' '
        CALL    POUT
        DCR     B
        JNZ     PGSPL
        CALL    PRPGCNT ; PRINT PAGE NUMBER (PGCNT BUFFER)
        CALL    CR
        POP     B
SPPGL0  CALL    LF
        DCR     B
        JNZ     SPPGL0
*  CHECK FOR PAUSE ON OUTPUT OPTION
        LDA     OFLAG   ; CHECK FOR PAGING
        CPI     'P'
        JNZ     SPPG1
        CALL    SKCHEK  ; CHECK FOR SKIP; RET W/NZ IF YES
        JNZ     SPPGL1
        CALL    ZPRR
        DB      'PLEASE INSERT NEXT PAGE',0
        CALL    ZESC    ; ESCAPE
        CALL    ZCR
SPPGL1  LDA     NL1     ; RESET CNT
        STA     NL1BF
        PUSH    H       ; SAVE HL
        LHLD    PGCNT   ; INCR PAGE COUNT
        INX     H
        SHLD    PGCNT
        POP     H
        CALL    SKCHEK  ; CHECK FOR SKIP; RET W/NZ IF YES
        JZ      PGSPL1
        PUSH    H       ; SAVE HL
        LHLD    SKFLG   ; GET SKIP COUNT
        DCX     H
        SHLD    SKFLG
        POP     H
PGSPL1  PUSH    H
        CALL    WBSAV
*  PRINT HEADING OF NEXT PAGE IF REQUESTED
        LDA     HDFLG   ; HEADING?
        ORA     A
        CNZ     PHEAD
        CALL    WBRES
        JMP     PHEAD1
*  SKIP CHECK UTILITY; RET W/NZ IF SKIPPING IN PROGRESS
SKCHEK  PUSH    H       ; SAVE HL
        LHLD    SKFLG   ; GET SKIP FLAG
        MOV     A,H
        ORA     L
        POP     H       ; GET HL
        RET
*  PRINT FOOTER
PFOOT   LXI     H,FTBUF ; PRINT FOOTER
        JMP     PHEADS
*  PRINT HEADER
PHEAD   LXI     H,HBUF  ; PRINT HEADING IN BUFFER
PHEADS  MVI     A,1     ; SET TAB CNT
        STA     TABC
PHEAD0  MOV     A,M     ; GET CHAR
        CPI     ' '
        RC
        CPI     CCHAR   ; COMMAND?
        JNZ     PHEADP
        INX     H       ; COMMAND NAME?
        MOV     A,M
        CALL    CAPS    ; CAPITALIZE
        INX     H
*  PRINT PAGE NUMBER?
        CPI     '#'     ; PAGE NUMBER?
        JNZ     PH1
        CALL    PRPGCNT ; PRINT PAGE NUMBER
        JMP     PHEAD0
*  DISPLAY REGISTER?
PH1     CPI     'D'
        JNZ     PH2
        CALL    GETNUM
        MOV     C,A
        CALL    LOCR
*  PRINT NUMBER IN A REG AS DECIMAL
PHEADD  PUSH    H
        CALL    DOT2A   ; PRINT
        LDA     TABC
        INR     A
        INR     A
        STA     TABC
        POP     H
        JMP     PHEAD0
*  DISPLAY AND INCREMENT REGISTER?
PH2     CPI     'R'
        JNZ     PH3
        CALL    GETNUM
        MOV     C,A
        CALL    LOCR
        MOV     B,A
        CALL    INCR2
        MOV     A,B
        JMP     PHEADD
*  TABULATE?
PH3     CPI     'T'
        JNZ     PHE
        CALL    GETNUM
        MOV     C,A
        LDA     TABC
        MOV     B,A
        CMP     C
        JNC     PHEAD0
        MOV     A,C
        STA     TABC
PH3L    MVI     A,' '   ; TAB
        CALL    POUT
        INR     B
        MOV     A,C
        CMP     B
        JNZ     PH3L
        JMP     PHEAD0
PHE     DCX     H       ; PT TO $CHAR
        MOV     A,M
PHEADP  CALL    POUT    ; PRINT CHAR
        LDA     TABC
        INR     A
        STA     TABC
        INX     H
        JMP     PHEAD0
PHEAD1  CALL    CRLF
        CALL    CRLF
        POP     H
        RET
*  PRINT PAGE NUMBER AS 4 DECIMAL DIGITS
PRPGCNT PUSH    H       ; SAVE HL
        LHLD    PGCNT   ; GET PAGE NUMBER
        XRA     A       ; SET LEADING <SP> FLAG
        STA     LSPFL
        LXI     D,-1000 ; COMPUTE 1000'S
        CALL    PRPGC
        LXI     D,1000  ; ADD IN
        DAD     D
        LXI     D,-100  ; COMPUTE 100'S
        CALL    PRPGC
        LXI     D,100   ; ADD IN
        DAD     D
        LXI     D,-10   ; COMPUTE 10'S
        CALL    PRPGC
        LXI     D,10    ; ADD IN
        DAD     D
        MOV     A,L     ; COMPUTE 1'S
        ADI     '0'     ; ASCII BIAS
        CALL    POUT
        POP     H       ; GET HL
        RET
*  ADD DE TO HL UNTIL HL BECOMES NEG OR ZERO; PRINT COUNT OR LEADING <SP>
PRPGC   MVI     B,0     ; COUNT
PRPGC1  DAD     D       ; ADD IN DE
        MOV     A,H     ; NEG?
        CPI     0F8H
        JNC     PRPGC2
        INR     B       ; INCR COUNT
        JMP     PRPGC1
PRPGC2  LDA     LSPFL   ; GET LEADING <SP> FLAG
        ORA     B       ; CHECK FOR LEADING <SP> AND ZERO COUNT
        STA     LSPFL   ; NEW LEADING <SP> FLAG
        JNZ     PRPGC3
        MVI     A,' '   ; PRINT LEADING <SP>
        JMP     POUT
PRPGC3  MOV     A,B     ; GET COUNT
        ADI     '0'     ; ASCII BIAS
        JMP     POUT
*  WORD BUFFER SAVE UTILITY
WBSAV   LXI     H,WBUF-1
        LXI     D,WTBUF
WBS1    MVI     C,41
        JMP     LCIR
*  WORD BUFFER RESTORE UTILITY
WBRES   LXI     H,WTBUF
        LXI     D,WBUF-1
        JMP     WBS1
*  PRINT STRING PTED TO BY HL AND ENDING IN 0 ON PROPER DEVICE
```

```
PHL     MOV     A,M     ; GET CHAR
        ORA     A
        RZ              ; 0 AT END=DONE
        INX     H
        CALL    POUT    ; PRINT CHAR
        JMP     PHL
*  DO JUST <LF>
LF      MVI     A,0AH
        JMP     POUT
*  DO JUST <CR>
CR      MVI     A,0DH
        CALL    POUT
        LDA     NULLS   ; <NULLS> OUTPUT
        ORA     A
        RZ
        MOV     B,A
        XRA     A
NULLO   CALL    POUT
        DCR     B
        JNZ     NULLO
        RET
*
*  READLN — READS AN INPUT LINE FROM THE CONSOLE AND PREPARES
*       IT FOR USAGE BY TFS
*
READLN  LXI     D,INLINE        ; PT TO BUFFER
        MVI     A,INLEN         ; PLACE LENGTH OF LINE IN BUFFER
        STAX    D
        MVI     C,10    ; CP/M READ BUFFER ROUTINE
        PUSH    D       ; STACK HOLDS PTR TO 1ST BYTE OF BUFFER
        CALL    BDOS
        POP     H       ; HL PTS TO 1ST BYTE OF BUFFER
        INX     H       ; PT TO CURRENT BUFFER LENGTH
        MOV     A,M     ; ... IN A
        INX     H       ; PT TO 1ST BYTE OF TEXT
        ADD     L       ; COMPUTE PTR TO 1 BYTE AFTER LAST BYTE OF TEXT
        MOV     L,A
        MOV     A,H
        ACI     0
        MOV     H,A
        MVI     M,0DH   ; PLACE <CR> <LF> AFTER THE LINE
        INX     H
        MVI     M,0AH
        CALL    ZCR     ; NEW LINE
        RET
*  TRAP UTILITY FOR INVALID INPUT LINE COMMANDS
RDFCK1  LDA     RDFLG1  ; INPUT LINE READ CHECK
        ORA     A
        RZ
        CALL    PERR
        DB      'INVLD CMND IN KEYBOARD INPUT LINE',0
        JMP     ZEOR


*
```

```
*
*  TFS COMMAND SECTION
*


*%KB — INPUT AND PROCESS LINE FROM KEYBOARD
KB      CALL    ZCR     ; NEW LINE
*  PRINT TEXT OF MESSAGE TO CONSOLE
KB1     MOV     A,M     ; GET CHAR
        CPI     0DH     ; DONE?
        JZ      KB2
        CALL    ZOUT
        INX     H       ; PT TO NEXT
        JMP     KB1
*  SET SOURCE FILE PTR, READ LINE, AND PT TO 1ST CHAR OF LINE
KB2     SHLD    RTEMP1  ; SET SOURCE FILE PTR
        MVI     A,0FFH  ; TURN ON INPUT LINE READ FLAG
        STA     RDFLG1
        CALL    ZPRR    ; PRINT INPUT PROMPT
        DB      'INPUT: ',0
        CALL    READLN  ; READ INPUT LINE FROM CONSOLE
        LXI     H,INLINE+2      ; PT TO FIRST CHAR TYPED
        RET

*%SP — SET INTER-LINE SPACING
SPSET   CALL    GETNUM
        STA     SPCNT
        RET

*%CH — START NEW CHAPTER
CHAP    CALL    GETNUM
        PUSH    H       ; SAVE PTR
        PUSH    PSW     ; SAVE #
        CALL    PAGE
        CALL    CR      ; <CR>
        MVI     B,10    ; DOWN 10
        LDA     NL1BF   ; CORRECT CNT
        SUB     B
        STA     NL1BF
        MVI     A,0AH   ; <LF>
CHAPL   CALL    POUT
        DCR     B
        JNZ     CHAPL
        LDA     BUFLEN  ; CENTER
        SUI     10      ; COMPUTE OFFSET
        CALL    CENCNT  ; COMPUTE <SP> CNT
        LDA     LMAR    ; GET LEFT MARGIN
        ADI     1       ; DIVIDE BY 2
        RAR
        ANI     7FH     ; MAKE SURE MSB NOT SET
        ADD     B       ; ADD IN <SP> CNT
        MOV     B,A     ; NEW <SP> CNT
        MVI     A,' '
CHAPC   CALL    POUT
        DCR     B
        JNZ     CHAPC
        CALL    PRNTP
        DB      'CHAPTER ',0
        POP     PSW     ; GET NUM
        CALL    DOT2
        CALL    CRLF
        POP     H       ; GET PTR
        JMP     CEN     ; CENTER CHAPTER TITLE

*$UL — UNDERLINE TOGGLE
UL      LDA     ULINE   ; GET UNDERLINE FLAG
        ORA     A       ; CHECK FOR ZERO
        JZ      UL1
        XRA     A       ; GET A ZERO
UL0     STA     ULINE
        RET
UL1     MVI     A,80H   ; SET UL FLAG
        JMP     UL0

*$AP — AUTOMATIC PARAGRAPH TOGGLE
APAR    LDA     APFLG   ; TOGGLE AUTO PAR FLAG
        CMA
        STA     APFLG
        RET

*$ASIS — ENTER ASIS MODE
ASIS    CALL    RDFCK
        CALL    RDFCK1  ; ASIS MAY NOT BE IN DATA FILE OR INPUT LINE
        CALL    BREK
ASIS00  MOV     A,M     ; SKIP TO NEXT LINE
```

```
        INX     H
        CPI     0DH     ; <CR>
        JNZ     ASIS00
        INX     H       ; PT TO 1ST CHAR OF NEXT LINE
ASIS0   MOV     A,M
        CPI     EOF     ; END OF FILE?
        JZ      DONE
        CPI     CCHAR   ; ESCAPE CHAR IS CCHAR
        JZ      AIRET
        LXI     D,LBUF  ; SEND LINE TO BUFFER
        MVI     B,0     ; INIT CHAR CNT
ASIS1   MOV     A,M     ; GET CHAR
        CPI     0DH     ; DONE?
        JZ      ASIS2
        INX     H
        INR     B       ; INCR CHAR CNT
        CPI     9       ; <TAB>?
        JZ      ASIST
        STAX    D       ; STORE CHAR FOR OUTPUT
        INX     D
        JMP     ASIS1
ASIST   MVI     A,' '   ; <TAB> ENCOUNTERED -- <SP> APPROPRIATELY
        STAX    D
        INX     D
        MOV     A,B     ; CHAR CNT
        ANI     7       ; EVERY 8
        JZ      ASIS1
        INR     B       ; INCR CHAR CNT
        JMP     ASIST
ASIS2   MOV     A,B
        INR     A       ; COUNT TRAILING <SP>
        STA     NCHARS  ; CHAR COUNT
        MVI     A,' '   ; PLACE A <SP> AT EOL
        STAX    D
        PUSH    H
        CALL    PRINT   ; PRINT LINE
        CALL    BREK1   ; RESET LINE
        CALL    ZINK    ; INT CHECK
        POP     H
        JMP     ASIS00
AIRET   MOV     A,M     ; FIND <CR>
        INX     H
        CPI     0DH
        JNZ     AIRET
        DCX     H         ; PT TO <CR>
        XRA     A         ; RESET CHAR CNT
        STA     NCHARS
        JMP     FWRD

*%REM -- SKIP TO NEXT LINE OF SOURCE; ALSO A UTILITY
NXTLN   MOV     A,M       ; FIND <CR>
        INX     H
        CPI     0DH
        JNZ     NXTLN
        DCX     H         ; PT TO <CR>
        JMP     FWRD      ; DO FIND WORD PROCESSING
* TEST OF CENTERING AND CENTER IF SET
CTEST   LDA     CENFL     ; %C?
        ORA     A
        JNZ     CENTER
        LDA     CENBFL    ; %CB?
        ORA     A
        RZ
* CENTER ROUTINE FOR %C (CENTER) COMMAND; ALSO A UTILITY
CENTER  XRA     A         ; TURN OFF CENTERING
        STA     CENFL
        CALL    CENL0     ; CENTER LINE
        JMP     BREK1     ; BREAK FOR NEW LINE
CENL0   LDA     NCHARS    ; GET NUM OF CHARS IN LINE
        ORA     A         ; NONE?
        RZ
        MOV     C,A       ; ... IN C
        LDA     BUFLEN    ; LENGTH OF PHYSICAL LINE
        SUB     C
        JC      PRINT
        JZ      PRINT
        CALL    CENCNT    ; COMPUTE CENTERING <SP> COUNT
        MVI     A,' '     ; <SP>
CENL1   CALL    POUT
        DCR     B
        JNZ     CENL1
        JMP     PRINT
*  COMPUTE CENTERING <SP> COUNT
CENCNT  RAR               ; DIVIDE BY 2
        ANI     7FH       ; MAKE SURE DIVISIBLE BY 2
        MOV     B,A       ; COUNT IN B
        RET

*$EXIT, $STOP, $HALT -- RETURN TO OPERATING SYSTEM
EXIT    CALL    PAGE
        JMP     ZEOR

*$C -- BREAK LINE AND CENTER ONE LINE
CEN     CALL    BREK
        MVI     A,1      ; SET FLAG
        STA     CENFL
        RET

*$CB -- BREAK LINE AND TOGGLE BLOCK CENTERING
CENB    CALL    BREK
        LDA     CENBFL   ; GET FLAG
        CMA              ; TOGGLE
        STA     CENBFL
        RET

*$FOOT -- DEFINE PAGE FOOTER
FOOT    INX     H        ; SET UP FOOTER
        LXI     D,FTBUF
        LDA     HDFLG    ; SAVE HDFLAG
        STA     TMP
        CALL    HEADC
        LDA     TMP
        STA     HDFLG
        MVI     A,1      ; SET FOOT FLAG
        STA     FTFLG
        RET

*$HEAD -- DEFINE PAGE HEADER
HEAD    INX     H        ; PT TO 1ST CHAR
        LXI     D,HBUF
HEADC   MOV     A,M      ; STORE LINE
        STAX    D
        INX     H
        INX     D
        CPI     0DH
        JNZ     HEADC
        DCX     H        ; PT TO <CR>
        DCX     D
        XRA     A        ; LAST CHAR=0
        STAX    D
        MVI     A,1     ; SET HEAD FLG
        STA     HDFLG
        RET

*$CR — CARRIAGE RETURN
CARET   LDA     NCHARS  ; CHECK FOR ZERO CHARS
        ORA     A
        JZ      CRLF    ; JUST <CR> IF NO LINE

*$BR — BREAK LINE
BREK    LDA     NCHARS  ; CHECK FOR ZERO CHARS
        ORA     A
        JZ      BREK1
        PUSH    H
        CALL    CTEST   ; CENTER IF ENGAGED
        CALL    OUTLN   ; PRINT CURRENT LINE IF NOT CENTERED
        POP     H
BREK1   PUSH    H       ; SAVE PTR TO NEXT WORD
        XRA     A       ; RESET NO CHARS
        STA     NCHARS
        LXI     H,LBUF
        SHLD    CPOS    ; RESET CUR POS IN OUTPUT LINE
        CALL    CLERL   ; CLEAR OUTPUT LINE
        CALL    LMARG   ; SET LEFT MARG
        POP     H
        RET

*$RJ — SET RIGHT JUSTIFICATION ON
RJ      MVI     A,1     ; SET RJ FLAG
        STA     RJFLG
        RET

*$NORJ — SET RIGHT JUSTIFICATION OFF
NORJ    XRA     A       ; CLEAR RJ FLAG
        STA     RJFLG
        RET

*$PAUS — PAUSE FOR OPERATOR ACTION
PAUSE   MOV     A,M     ; GET CHAR
        CPI     0DH     ; EOL?
        JZ      PAUS1
        INX     H       ; PT TO NEXT
        CALL    ZOUT    ; PRINT MSG
        JMP     PAUSE
PAUS1   CALL    PAUSM
        JMP     ZCR
PAUSM   CALL    ZPRR
        DB      '  TYPE ANY CHAR WHEN READY, <ESC> OR CTRL-C TO ABORT',0
        CALL    ZESC    ; ESCAPE
        RET

*$ENDM — END OF MACRO; RETURN TO NORMAL PROCESSING FLOW
MMEND   CALL    RDFCK
        CALL    RDFCK1  ; ENDM MAY NOT BE IN DATA FILE OR INPUT LINE
        LXI     H,ATAB  ; GET RET ADR
        MOV     A,M     ; CNT IN A
        ORA     A
        JZ      MMENDE
        DCR     A       ; SET NEXT ADR
        MOV     M,A
        ADD     A       ; DOUBLE A FOR ADR
        INX     H
        CALL    ADR     ; HL PT TO RET ADR
        MOV     E,M
        INX     H
        MOV     D,M     ; DE=NEW HL
        XCHG            ; HL LOADED
        RET
MMENDE  CALL    PERR
        DB      'MACRO RET ERR',0
        JMP     ZEOR    ; RETURN TO OS

*$P — START NEW PARAGRAPH; ALSO USED FOR AUTOMATIC PARAGRAPHING
PAR     CALL    BREK    ; BREAK CURRENT LINE
        LDA     PSKIP   ; SKIP LINES BET PARS
        ORA     A
        JZ      PAR1
        STA     TMP
PARSL   CALL    CRLF
        LDA     TMP
        DCR     A
        STA     TMP
        JNZ     PARSL
PAR1    LDA     IDNT    ; GET # CHARS IN INDENT
        ORA     A
        RZ
        MOV     B,A     ; CNT IN B
        LDA     NCHARS
        ADD     B       ; NEW CHAR CNT
        STA     NCHARS
        PUSH    H
        LHLD    CPOS    ; GET CURRENT POSITION
PARL    MVI     M,0A0H  ; SIGNIFICANT <SP>
        INX     H
        DCR     B
        JNZ     PARL
        SHLD    CPOS
        POP     H
        RET

*%PAGE — START NEW PAGE
PAGE    CALL    BREK
        LDA     NL1BF   ; SKIP DOWN PAGE
        MOV     B,A
        XRA     A
        STA     NL1BF
        MVI     A,0AH   ; <LF>
PAGEL   CALL    POUT
        DCR     B
        JNZ     PAGEL
        JMP     CRLF1

*%TP — TEST FOR SPECIFIED NUMBER OF LINES LEFT ON PAGE
TPG     CALL    BREK
        CALL    GETNUM
        MOV     B,A
        LDA     NL1BF   ; COMPARE AGAINST LINES LEFT
        SUB     B
        RNC
        JMP     PAGE
*  LOOP FLAG CLEAR UTILITY
LPCLR   XRA     A       ; CLEAR LOOP FLAGS
        STA     CLFLG
        STA     LLFLG
        RET

*%COPY — SET START OF COPY LOOP
COPY    CALL    RDFCK
```

```
        CALL    RDFCK1  ; COPY MAY NOT BE IN DATA FILE OR INPUT LINE
        CALL    GETNUM  ; DEF CPY BLOCK
        STA     NCOPY   ; # COPIES
        CALL    FWRD    ; FIND NEXT WORD
        SHLD    CPYLP   ; SAVE PTR
        MVI     A,1     ; SET COPY LOOP ON FLAG
        STA     CLFLG
        RET

*%ENDC — END OF COPY LOOP
CPYEND  LDA     NCOPY   ; CHECK CNT
        ORA     A
        RZ
        DCR     A
        STA     NCOPY   ; NEW CNT
        RZ
        LDA     CLFLG   ; CHECK COPY LOOP ON FLAG
        ORA     A
        JZ      LPERR
        LHLD    CPYLP   ; PT TO LOOP ADR
        RET

*%LOOP — SET START OF INFINITE (TERMINATED BY %LEX) LOOP
LOOPLP  CALL    RDFCK
        CALL    RDFCK1  ; LOOP MAY NOT BE IN DATA FILE OR INPUT LINE
        SHLD    LPLP    ; SAVE PTR TO LOOP
        MVI     A,1     ; SET LOOP LOOP ENGAGED FLAG
        STA     LLFLG
        RET

*%ENDL — END OF INFINITE LOOP
LPEND   SHLD    LPEX    ; SAVE PTR TO LOOP END
        LDA     LLFLG   ; CHECK LOOP LOOP ON FLAG
        ORA     A
        JZ      LPERR
        LHLD    LPLP    ; GET PTR TO LOOP START
        RET

*%LEX — EXIT INFINITE LOOP
LPEXIT  LDA     LLFLG   ; CHECK LOOP LOOP ON FLAG
        ORA     A
        JZ      LPERR
        LDA     RDFLG1  ; IN INPUT LINE?
        ORA     A
        JZ      LPEX01
        XRA     A
        STA     RDFLG1  ; NOT IN INPUT LINE ANYMORE
        JMP     LPEX1
LPEX01  LDA     RDFLG   ; IN DATA FILE?
        ORA     A
        JZ      LPEX1
        XRA     A
        STA     RDFLG   ; NOT IN DATA FILE ANYMORE
LPEX0   MOV     A,M     ; SKIP TO EOL OF DATA
        INX     H
        CPI     0DH
        JNZ     LPEX0
        SHLD    DPTR    ; NEW DATA FILE PTR
LPEX1   LHLD    LPEX    ; GET PTR TO LOOP EXIT
        RET
LPERR   CALL    PERR
        DB      'LOOP ERR',0
        JMP     ZEOR

*%SKIP — SKIP SPECIFIED NUMBER OF LINES
SKIP    CALL    BREK
        CALL    GETNUM  ; GET # LINES
        MOV     B,A
        LDA     NL1BF   ; COMPUTE DIFF
        SUB     B
        JC      PAGE
        JZ      PAGE
        STA     NL1BF   ; NEW CNT
        MVI     A,0AH   ; A=<LF>, B=# LINES TO SKIP
SKIPL   CALL    POUT
        DCR     B
        JNZ     SKIPL
        RET

*%SAVE — SAVE WORKING ENVIRONMENT
SAV     PUSH    H
        LXI     H,ENVIR1        ; MOVE ENVIRONMENT 1 TO 2
        LXI     D,ENVIR2
SRMOV   MVI     C,ENLEN ; NUMBER OF BYTES IN ENVIRONMENT
        CALL    LCIR    ; COPY HL TO DE FOR C BYTES
        POP     H
        RET

*%RES — RESTORE WORKING ENVIRONMENT FROM PREVIOUS SAVE
RES     PUSH    H
        LXI     H,ENVIR2        ; MOVE ENVIRON 2 TO 1
        LXI     D,ENVIR1
        JMP     SRMOV

*%PX — START EXTENDED PARAGRAPH
PARX    CALL    BREK    ; BREAK CURRENT LINE
        LDA     PSKIPX  ; SKIP LINES BET PARS
        ORA     A
        JZ      PARX1
        STA     TEMP
PARXSL  CALL    CRLF
        LDA     TEMP
        DCR     A
        STA     TEMP
        JNZ     PARXSL
PARX1   LDA     XDNT    ; GET # CHARS TO XDENT
        ORA     A
        RZ
        MOV     B,A
        LDA     NCHARS
        SUB     B       ; NEW CHAR CNT FOR LINE
        JC      PARXE
        STA     NCHARS
        PUSH    H
        LHLD    CPOS    ; GET CURRENT POSITION
PARXL   DCX     H       ; BACK UP POINTER
        DCR     B
        JNZ     PARXL
        SHLD    CPOS    ; NEW CURRENT POSITION
        POP     H
        RET
PARXE   PUSH    H
        CALL    PERR
        DB      'XDENT ERR',0
        POP     H
        RET

*%PAR — SET NORMAL PARAGRAPH PARAMETERS (INDENT, NUM LINES BET PARS)
STPAR   CALL    GETNUM  ; GET NUMERIC VALUE
```

```
        STA     IDNT    ; SET INDENT COUNT
        CALL    GETNUM
        STA     PSKIP   ; SET NO OF LNS BET PAR TO SKIP
        RET

*$PARX — SET EXTENDED PARAGRAPH PARAMETERS
STPARX  CALL    GETNUM
        STA     XDNT    ; SET XDENT COUNT
        CALL    GETNUM
        STA     PSKIPX  ; SET NUMBER OF LINES TO SKIP
        RET

*$LMAR — SET LEFT MARGIN
STLMAR  CALL    GETNUM
        STA     LMAR    ; SET LEFT MARGIN
        RET

*$LLEN — SET LINE LENGTH
STLLEN  CALL    GETNUM
        MOV     B,A     ; SAVE IN B
        LDA     LMAR    ; ADD TO LEFT MARG
        ADD     B
        STA     BUFLEN  ; SET LENGTH OF LINE
        RET

*$PGON — TURN ON PAGE NUMBERING
STPAGE  MVI     A,1     ; TURN ON PAGE NUMBER FLAG
        STA     PGFLAG
        PUSH    H
        LXI     H,1     ; SET NEXT PAGE TO BE 2
        SHLD    PGCNT
        POP     H
        CALL    GETNUM  ; GET POS
        STA     LNLEN   ; LINE LENGTH
        RET

*$PGOF — TURN OFF PAGE NUMBERING
PAGEOF  XRA     A       ; TURN OFF PAGE
        STA     PGFLAG
        RET

*$PNUM — SET NUMBER OF NEXT PAGE
STPNUM  CALL    GETNUM
```

```
        XCHG            ; GET PAGE NUM IN HL
        SHLD    PGCNT
        XCHG            ; RESTORE HL
        RET

*$LINE — SET NUMBER OF TEXT/PHYSICAL LINES ON A PAGE
STLINE  CALL    GETNUM
        STA     NL1     ; NUMBER OF TEXT LINES ON A PAGE
        STA     NL1BF   ; RESET PAGING
        MOV     B,A     ; CNT IN B
        PUSH    B
        CALL    GETNUM
        POP     B
        SUB     B       ; REMAINDER IN B
        STA     NL2     ; NUMBER OF EXTRA LINES ON PG
        CALL    ZPRR
        DB      'NEW PAGE SETTING — PLEASE SET TOP OF FORM',0
        CALL    ZESC    ; ESCAPE
        CALL    ZCR
        RET
*  DECIMAL PRINT UTILITY — PRINT A REG AS 2 DECIMAL DIGITS
DOT2    CALL    DOT2A
        JMP     CRLF
DOT2A   MVI     B,10    ; COMPUTE TENS
        MVI     C,0     ; CNT=0
DOT2L   SUB     B       ; SUBTRACT
        JC      DOT1A
        JZ      DOT1
        INR     C       ; INCR CNT
        JMP     DOT2L
DOT1    JNZ     DOT1A
        INR     C       ; ADD 1 TO CNT
        JMP     DOT1B
DOT1A   ADD     B       ; ADD B BACK
DOT1B   MOV     B,A     ; STORE ONES IN B
        MOV     A,C     ; CNT IN C
        ADI     '0'
        CPI     '0'     ; LEADING <SP>?
        JNZ     DOT1C
        MVI     A,' '   ; <SP>
DOT1C   CALL    POUT
        MOV     A,B     ; ONES IN A
        ADI     '0'
        CALL    POUT
        RET
*  [illegible]UTE POSITION OF LEFT MARGIN (COL NUM) UTILITY
[illegible] LDA     LMAR    ; GET CHAR CNT FOR LEFT MAGIN
        ORA     A
        RZ
        PUSH    H
        LXI     H,LBUF  ; GET START OF LINE
        MOV     B,A     ; CNT IN B
        STA     NCHARS  ; UPDATE LINE CHAR CNT
LMARGL  MVI     M,0A0H  ; SIGNIFICANT <SP>
        INX     H
        DCR     B
        JNZ     LMARGL
        SHLD    CPOS    ; RESET CURRENT POSITION
        POP     H
        RET
*  GETNUM UTILITY -- GET NEXT WORD AS DECIMAL NUMBER & CONVERT TO BINARY
*    RETURN W/HL PTING TO NEXT WORD, VALUE IN A, ERROR = ZERO FLAG SET
GETNUM  CALL    SWRD    ; GET NEW WORD
        PUSH    B
        PUSH    H
        LXI     H,WBUF-1
        MOV     A,M     ; CHECK FOR DIGIT CNT
        ORA     A
        JZ      DIGERR  ; ERROR IF NO DIGITS
        LXI     D,0     ; ACCUMULATED VALUE IN DE
        MOV     B,A     ; COUNT IN B
DIG1    INX     H       ; PT TO NEXT DIGIT
        MOV     A,M     ; GET DIGIT
        SUI     '0'     ; ASCII BIAS
        JC      DIGERR
        CPI     10      ; RANGE TEST
        JNC     DIGERR
        PUSH    PSW     ; SAVE VALUE ON STACK
        PUSH    H       ; SAVE HL
        MOV     H,D     ; HL=DE
        MOV     L,E
        MVI     C,9     ; MULT DE BY 10
DIG2    DAD     D       ; HL=HL+DE
        DCR     C
        JNZ     DIG2
        MOV     D,H     ; NEW ACCUMULATED VALUE IN DE
        MOV     E,L
        POP     H       ; GET HL BACK
        POP     PSW     ; GET VALUE TO ADD TO
        ADD     E
        MOV     E,A
        MOV     A,D
        ACI     0
        MOV     D,A     ; DE=ACCUMULATED VALUE
        DCR     B       ; COUNT DOWN
        JNZ     DIG1
        MVI     A,1     ; SET NOT ZERO (NO ERROR)
        ORA     A
        MOV     A,E     ; LOW-ORDER IN A
        JMP     DIGER1
DIGERR  CALL    PERR
        DB      'INVLD NUM',0
        JMP     ZEOR    ; EXIT TO CP/M
DIGER1  POP     H
        POP     B
        RET
*  PRINT ERROR UTILITY — PLACE ERROR MSG ON CON:; MSG PTED TO BY RET ADR
PERR    MVI     A,'$'   ; PRINT ERROR
        CALL    ZOUT
        CALL    ZOUT
        MVI     A,' '
        CALL    ZOUT
PPRNT   POP     H
PERRL   MOV     A,M     ; GET CHAR
        INX     H
        ORA     A       ; CHECK IF DONE
        JZ      PERRD
        CALL    ZOUT
        JMP     PERRL
PERRD   PCHL

*$APND — APPEND FILE TO OUTPUT; CURRENT FILE CLEARED
APND    CALL    LPCLR   ; CLEAR LOOP FLAGS
        XRA     A
        STA     MTAB    ; CLEAR MACRO TABLE
        CALL    SETFCB  ; GET FCB FROM NEXT WORD
        CALL    LOAD    ; GET FILE
        CALL    ZCR
        LXI     H,ZBOF  ; PT TO 1ST WORD
        RET
*  SET FCB UTILITY — EXTRACT NEXT WORD AS FILE SPEC AND INIT FCB
SETFCB  PUSH    H        ; SAVE PTR TO NEXT WORD
        LXI     D,FCB    ; CLEAR FCB
        MVI     A,0
        MVI     B,33     ; 33 BYTES
        CALL    FILL     ; FILL BUFFER
        MVI     C,11     ; 11 CHARS
        LXI     D,FCB+1  ; PT TO EXT IN FCB
        LXI     H,DEXT   ; PT TO 'TFS'
        CALL    LCIR     ; PLACE DEFAULT EXT
        POP     H        ; GET PTR TO NEXT WORD
        CALL    SWRD     ; GET FILE NAME
        LXI     H,WBUF+1         ; CHECK FOR DRIVE SPEC
        MOV     A,M      ; COLON?
        DCX     H        ; PT TO 1ST CHAR IN WBUF
        CPI     ':'
        JNZ     SFCB0
        MOV     A,M      ; GET DRIVE LETTER
        CALL    SETDRV   ; LOG IN DRIVE
        INX     H        ; SKIP DRIVE SPEC
        INX     H
SFCB0   MVI     B,8      ; 8 CHARS IN FILE NAME
        LXI     D,FCB+1  ; STORE IN FCB
SFCB1   MOV     A,M      ; GET CHAR
        CPI     ' '+1    ; <SP>?
        RC
        CPI     '.'      ; EXTENSION?
        JZ      SFCB2
        CALL    CAPS
        STAX    D        ; STORE OTHERWISE
        INX     H
        INX     D
        DCR     B
        JNZ     SFCB1
SFCB2   MOV     A,M      ; EXT?
        CPI     '.'
        RNZ
        INX     H        ; PT TO 1ST BYTE OF EXT
        MVI     B,3      ; 3 BYTES
        LXI     D,FCB+9
SFCB2E  MOV     A,M      ; GET CHAR
        CPI     ' '+1
        RC
        CALL    CAPS
        STAX    D       ; PUT CHAR
        INX     H       ; PT TO NEXT
        INX     D
        DCR     B
        JNZ     SFCB2E
        RET
*  LOG IN DRIVE WHOSE LETTER IS IN A REG
SETDRV:
        PUSH H ! PUSH D ! PUSH B
        STA     CUR$DRV ; SET CURRENT DRIVE
        SUI     'A'     ; CONVERT A-D TO 0-3
        CPI     4       ; ERROR?
        JNC     SDRERR
        MOV     E,A     ; SET FOR CALL
        MVI     C,14    ; LOG IN AND SELECT DISK
        CALL    BDOS
        POP B ! POP D ! POP H
        RET
SDRERR  CALL    PERR
        DB      'ERROR — INVALID DISK DRIVE SPECIFIED',0
        JMP     ZEOR
*  FILE LOAD UTILITY — LOAD FILE SPEC BY FCB INTO TEXT BUFFER
LOAD    LXI     D,FCB   ; PT TO FCB
        PUSH    D       ; SAVE PTR
        CALL    ZPRR
        DB      '++ TFS ++   LOAD:  ',0
        POP     H       ; GET PTR TO FCB
        PUSH    H
        INX     H       ; PT TO FN
        CALL    PRFN
        POP     D       ; GET PTR
        MVI     C,15    ; OPEN FILE
        CALL    BDOS
        LXI     H,ZBOF  ; PT TO BOF
        CPI     0FFH    ; ERROR?
        JNZ     LOAD1
        CALL    PERR
        DB      'FILE NOT FOUND',0
        JMP     ZEOR
LOAD1   LXI     D,FCB   ; PT TO FCB
        MVI     C,20    ; READ NEXT RECORD
        LDA     BOOT+2  ; CHECK FOR FILE TOO LARGE
        DCR     A       ; BACK UP ONE PAGE FOR GOOD MEASURE
        CMP     H       ; H PT TO THIS PAGE? -- OVERFLOW IF SO
        JNZ     LOAD1C  ; CONTINUE IF NOT
        CALL    PERR    ; PRINT ERROR
        DB      'ERROR — TEXT BUFFER OVERFLOW — BREAK UP SOURCE FILE',0
        JMP     ZEOR
LOAD1C  PUSH    H       ; SAVE PTR
        CALL    BDOS
        POP     H
        PUSH    PSW     ; SAVE ERROR STATUS
        MVI     B,128   ; LOAD 128 BYTES
        LXI     D,BUFF  ; PT TO BUFFER
LOAD2   LDAX    D       ; GET BYTE
        MOV     M,A     ; PUT BYTE
        INX     H       ; PT TO NEXT
        INX     D
        DCR     B
        JNZ     LOAD2
        POP     PSW     ; GET ERROR STATUS
        ORA     A       ; 0=CONTINUE
        JZ      LOAD1
        MVI     M,EOF   ; ENSURE EOF
        RET

*%MAC — DEFINE MACRO
MMBEG   CALL    RDFCK
        CALL    RDFCK1  ; MAC MAY NOT BE IN DATA FILE OR INPUT LINE
        CALL    FWRD    ; GET MACRO NAME
        CALL    SWRD0   ; IN WBUF
        PUSH    H       ; SAVE PTR TO NEXT WORD
        LXI     H,MTAB  ; STORE IN TABLE
        MOV     A,M
        INR     M
        INX     H
        ORA     A       ; CHECK FOR FIRST
        JZ      MAC2
MAC0    MVI     B,CCNT+2        ; SKIP TO CORRECT ENTRY PT
MAC1    INX     H
        DCR     B
        JNZ     MAC1
        DCR     A
        JNZ     MAC0
```

```
MAC2    LXI     D,WBUF  ; DE PT TO CMND, HL PT TO TABLE LOC
        MVI     B,CCNT
        PUSH    H       ; SAVE PTR
MAC3    LDAX    D       ; GET & STORE
        CALL    CAPS    ; CAPITALIZE
        MOV     M,A
        INX     H
        INX     D
        CPI     ' '     ; DONE IF <SP>
        JZ      MAC4
        DCR     B
        JNZ     MAC3
MAC4    POP     H       ; PT TO START
        MVI     A,CCNT  ; PT TO ADR
        CALL    ADR     ; HL PT TO ADR POS
        SHLD    TMP1    ; SAVE PTR
        POP     H       ; GET PTR TO NEXT CHAR
MAC5    CALL    FWRD    ; FIND NEXT WORD
        XCHG
        LHLD    TMP1    ; GET TABLE LOC
        MOV     M,E
        INX     H
        MOV     M,D     ; ADR IN TABLE
        XCHG            ; HL PT TO NEXT WORD
MAC6    CALL    FWRD    ; FIND NEXT WORD
        CALL    SWRD0   ; PUT IN BUFFER
        PUSH    H
        LXI     H,WBUF
        MOV     A,M     ; CHECK FOR CCHAR
        INX     H
        CPI     CCHAR
        JNZ     MAC8
        LXI     D,MMENDS        ; END?
        MVI     B,CCNT
        XCHG            ; DE PTS TO ENTRY, HL TO 'ENDM'
MAC7    LDAX    D       ; CHECK
        CALL    CAPS    ; CAPITALIZE ENTRY
        CMP     M
        JNZ     MAC8
        INX     H
        INX     D
        DCR     B
        JNZ     MAC7
        POP     H       ; HL PT TO LOC AFTER MACRO
        RET
MAC8    POP     H
        JMP     MAC6    ; CONTINUE
*  NUMBER CONVERT UTILITY — CONVERT LOW BCD DIGIT TO ASCII
CNVRT   ANI     0FH
        ADI     '0'
        CPI     '0'
        RNZ
        MVI     A,0A0H
        RET
*  PLACE NUMBER IN REG A INTO OUTPUT LINE
PNUM    PUSH    PSW
        LXI     D,WBUF
        MVI     B,10    ; COMPUTE 10'S
        MVI     C,0     ; COUNT = 0
PNUM01  SUB     B       ; A=A-10
        JC      PNUM02
        INR     C       ; INCR 10'S
        JMP     PNUM01
PNUM02  ADD     B       ; ADD 10 BACK IN
        MOV     B,A     ; SAVE 1'S IN B
        MOV     A,C     ; GET 10'S
        ORA     A       ; PLACE ' ' IF ZERO
        JNZ     PNUM03
        MVI     A,' '   ; <SP>
        STAX    D       ; STORE
        JMP     PNUM04
PNUM03  ADI     '0'     ; CONVERT TO ASCII
        STAX    D       ; STORE
PNUM04  INX     D       ; PT TO NEXT
        MOV     A,B     ; GET 1'S
        ADI     '0'     ; CONVERT TO ASCII
        STAX    D       ; STORE
        MVI     A,' '   ; STORE TRAILING <SP>
        INX     D
        STAX    D
        MVI     A,2
        STA     WBUF-1
        MOV     C,A
        POP     PSW
        RET
```

```
*%SETN — INITIALIZE COUNTER N
NEQ     CALL    GETNUM  ; GET VALUE TO SET N TO
        STA     NO
        RET

*%N — DISPLAY AND INCREMENT COUNTER N
ND      LDA     NO
        CALL    PNUM
        INR     A
        STA     NO
        POP     D       ; CLEAR ADR
        POP     D
        RET

*%BS — BACKSPACE
BS      LDA     NCHARS
        DCR     A
        RC
        STA     NCHARS
        PUSH    H
        LHLD    CPOS
        DCX     H
        SHLD    CPOS
        POP     H
        RET
*  TRAP UTILITY FOR INVALID DATA FILE COMMANDS
RDFCK   LDA     RDFLG   ; READ DATA FILE CHECK
        ORA     A       ; ABORT IF IN A DATA FILE
        RZ
        CALL    PERR
        DB      'INVLD CMND IN DATA FILE',0
        JMP     ZEOR

*%OPEN — OPEN DATA FILE AND INITIALIZE DATA FILE BUFFER
OPEN    PUSH    H       ; SAVE PTR TO NEXT WORD
        CALL    SETFCB  ; SET UP FCB
        CALL    ZPRR
        DB      '++ TFS ++   OPEN:  ',0
        LXI     H,FCB+1 ; PT TO FCB NAME
        PUSH    H       ; SAVE PTR
        CALL    PRFN    ; PRINT FILE NAME
        POP     D       ; PTR TO FCB
        DCX     D       ; PT TO 1ST BYTE
        MVI     C,15    ; OPEN FILE
        CALL    BDOS
        LXI     H,DATA  ; PT TO BUFFER
        SHLD    DPTR    ; SET PTR TO NEXT WORD
        CPI     0FFH    ; ERROR?
        JNZ     OPEN1
        CALL    PERR
        DB      'DATA FILE NOT FOUND',0
        JMP     ZEOR
OPEN1   XRA     A       ; A=0
        STA     EOFLG   ; SET NOT EOF
        INR     A       ; A=1
        STA     DFLG    ; SET DF LOAD
        CALL    DCOM    ; LOAD 512 BYTES
        CALL    DCOM
        POP     H       ; RESTORE PTR TO NEXT WORD (FILE NAME)
        CALL    FWRD    ; FIND NEXT WORD
        JMP     SWRD0   ; DISCARD IT
*  PRINT FILE NAME UTILITY; FILE NAME IN FCB FORMAT PTED TO BY HL
PRFN    MVI     B,8     ; PRINT FILE NAME
        CALL    PRFN1
        MVI     A,'.'
        CALL    ZOUT
        MVI     B,3     ; PRINT EXTENSION
        CALL    PRFN1
        CALL    ZCR
        RET
PRFN1   MOV     A,M     ; GET CHAR
        CALL    ZOUT
        INX     H       ; PT TO NEXT CHAR
        DCR     B
        JNZ     PRFN1
        RET
*  LOAD 256 BYTES FROM DATA FILE
DCOM    CALL    DCOM0   ; LOAD 256 BYTES
DCOM0   LDA     EOFLG   ; EOF FROM LAST LOAD?
        ORA     A
        RNZ
        PUSH    H       ; SAVE PTR TO LOAD AREA
        MVI     C,20    ; READ NEXT RECORD
        LXI     D,FCB   ; PT TO FCB
        CALL    BDOS
        CPI     0FFH    ; EOF?
        JNZ     DCOM1
        STA     EOFLG   ; SET EOF ENCOUNTERED FLAG
DCOM1   POP     D       ; MOVE TO ADR IN DE
        LXI     H,BUFF  ; PT TO DATA
        MVI     C,128   ; 1/2 BLOCK
        CALL    LCIR
        XCHG            ; HL PTS TO NEXT LOAD ADR
        RET
*  INITIALIZE DATA FILE FLAGS
CLOSE1  XRA     A
        STA     RDFLG

*%CLOS -- CLOSE DATA FILE
CLOSE   CALL    RDFCK
        XRA     A
        STA     DFLG    ; RESET FLAGS
        STA     RDFLG
        RET

*%READ -- READ NEXT LINE FROM DATA FILE
READ    CALL    RDFCK
        SHLD    RTEMP   ; SAVE POINTER TO NEXT WORD
        LDA     DFLG    ; DF OPEN?
        ORA     A
        JNZ     READ1
        CALL    PERR
        DB      'DATA FILE NOT OPEN',0
        JMP     ZEOR
READ1   LHLD    DPTR    ; SET TFS NEXT WORD POINTER
        MVI     A,1     ; SET RDFLAG
        STA     RDFLG
        MOV     A,M
        CPI     EOF     ; EOF?
        JNZ     READ2
        CALL    PERR
        DB      'EOF OF DATA',0
        JMP     ZEOR
READ2   MOV     A,H     ; CHECK FOR 2ND BLOCK
        CPI     B2HI
        RNZ
        DCR     H       ; 256 BYTES LESS
        PUSH    H       ; SAVE PTR
        MVI     H,B2HI  ; PT TO HIGH BLOCK
        MVI     D,B2HI-1
        MVI     L,0
        MOV     E,L
        LXI     B,256
        PUSH    H
        CALL    LIR
        POP     H       ; HL = RAM ADR TO LOAD INTO
        CALL    DCOM
        POP     H       ; PT TO NEXT DATA RECORD TO READ
        RET             ; PT TO 1ST CHAR IN RECORD (LINE)

*%T — TAB TO NEXT TAB STOP
TAB     CALL    GETNUM  ; GET COLUMN NUMBER
        MOV     C,A     ; STORE IN C
        LDA     NCHARS  ; CHECK LINE CHAR CNT
        INR     A
        MOV     D,A
        MOV     E,A
        CMP     C
        RNC             ; DON'T TAB IF ALREADY BEYOND
        MOV     A,C     ; TAB STOP IN A
        SUB     D
        MOV     C,A     ; NUMBER OF CHARS TO MOVE
        MOV     B,A
        PUSH    H
        LXI     H,LBUF  ; MAKE <SP> SIG
TAB1    MOV     A,M
        CPI     ' '
        JNZ     TAB2
        ORI     80H     ; SET MSB
        MOV     M,A
TAB2    INX     H       ; PT TO NEXT
        DCR     D
        JNZ     TAB1
        DCX     H
TAB3    MVI     M,' '+80H
        INX     H
        DCR     C
        JNZ     TAB3
        SHLD    CPOS
        MOV     A,E
        ADD     B
        DCR     A
        STA     NCHARS
        POP     H
        RET
*  LOAD REG VALUE SPECIFIED IN C INTO A
LOCR    PUSH    H         ; LOCATE R VAL (R=C)
        LXI     H,RVTAB
        MOV     A,C
        CALL    ADR
        MOV     A,M       ; GET VAL
        XCHG              ; PTR IN DE
        POP     H
        RET

*$SETR — SET SPECIFIED REGISTER TO SPECIFIED VALUE
SETR    CALL    GETNUM    ; GET REGISTER NUMBER
        MOV     C,A
        CALL    LOCR      ; LOCATE REGISTER NUMBER IN C
        PUSH    D         ; SAVE REG LOC
        CALL    GETNUM    ; GET VALUE
        POP     D         ; GET REG LOC
        STAX    D         ; STORE VALUE
        RET

*$INCR — INCREMENT SPECIFIED REGISTER
INCR    CALL    GETNUM    ; GET REGISTER NUMBER
INCR1   MOV     C,A       ; REG NUM IN C
INCR2   CALL    LOCR      ; LOCATE REGISTER
        INR     A
        STAX    D         ; PLACE IT BACK
        RET

*$DR — DISPLAY CURRENT VALUE OF SPECIFIED REGISTER
DR      CALL    DR1
        POP     D
        POP     D
        RET
DR1     CALL    GETNUM
        MOV     C,A
        STA     TMP
        CALL    LOCR
        CALL    PNUM
        RET
```

```
*$R — DISPLAY CURRENT VALUE OF SPECIFIED REGISTER AND INCREMENT AFTERWARDS
RINC    CALL    DR1
        LDA     TMP
        CALL    INCR1
        POP     D
        POP     D
        RET

*$CLRR — CLEAR ALL REGISTERS
CLRR    PUSH    H
        LXI     H,RVTAB
        MVI     B,100
CLRR1   MVI     M,1
        INX     H
        DCR     B
        JNZ     CLRR1
        POP     H
        RET

*$BLK — DEFINE SIGNIFICANT BLANK CHARACTER
BLANK   CALL    SWRD     ; GET CHAR
        LDA     WBUF
        STA     BLK
        RET
*
```

```
*  DISPLAY OUTPUT CHAR UTILITY -- IF /V OPTION, PRINT ON CON:; OTHERWISE, LST:
POUT:
        PUSH    PSW
        ANI     7FH      ; MASK
        PUSH    B
        MOV     B,A
        LDA     BLK
        CMP     B
        JZ      POUTB
        MOV     A,B
POUTE   POP     B
        CALL    POUT0
        POP     PSW
        RET
POUTB   MVI     A,' '    ; PRINT BLANK
        JMP     POUTE
POUT0   PUSH    PSW
        CALL    SKCHEK   ; CHECK FOR SKIPPING; RET W/NZ IF YES
        JZ      POUT1
        POP     PSW      ; DON'T PRINT
        RET
POUT1   LDA     DOUT     ; CHECK FOR DISK OUTPUT
        ORA     A        ; 0=NO
        JNZ     POUT3    ; DISK OUTPUT
        LDA     OFLAG    ; CHECK FOR VIEW OPTION
        CPI     'V'
        JNZ     POUT2
        POP     PSW
        CPI     0DH      ; CHECK FOR <CR>
        JNZ     ZOUT
        CALL    ZESC     ; ESCAPE
        MVI     A,0DH    ; <CR>
        JMP     ZOUT
POUT2   POP     PSW      ; GET CHAR
        JMP     ZPOUT
POUT3   POP     PSW      ; GET CHAR
        JMP     F$PUT    ; PUT TO DISK

*
*  GENERAL SUPPORT SECTION
*
```

AD-A088 217 ARMY SATELLITE COMMUNICATIONS AGENCY FORT MONMOUTH NJ F/G 9/2
TFS--THE TEXT FORMATTING SYSTEM. A TEXT FORMATTER DESIGNED TO R--ETC(U)
JUL 80 R L CONN

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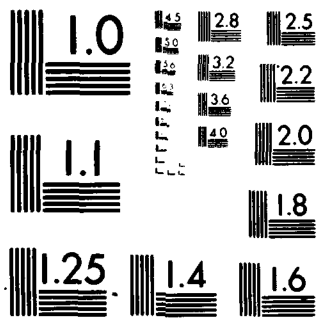

MICROCOPY RESOLUTION TEST CHART

```
        PUSH    D
        PUSH    B
        PCHL
GET     POP     H       ; GET RET ADR
        POP     B
        POP     D
        XTHL
        RET
*  CHAR INPUT FROM CON:
ZIN     CALL    PUT     ; SAVE REGS
        LXI     H,ZIN1  ; SET UP RET ADR
        PUSH    H
        LHLD    INADR   ; GET ADR OF INPUT ROUTINE
        PCHL
ZIN1    CALL    GET     ; RESTORE REGS
        RET
*  CHAR OUTPUT ON CON:
ZOUT    PUSH    PSW     ; SAVE A
        CALL    PUT     ; SAVE REGS
        MOV     C,A     ; CHAR IN C
        LXI     H,ZOUT1 ; SET UP RET ADR
        PUSH    H
        LHLD    OUTADR  ; GET ADR OF OUTPUT ROUTINE
        PCHL
ZOUT1   CALL    GET     ; RESTORE REGS
        POP     PSW     ; GET A
        RET
*  GET STATUS OF CON:
ZSTAT   CALL    PUT     ; SAVE REGS
        LXI     H,ZSTAT1        ; SETUP RET ADR
        PUSH    H
        LHLD    STADR   ; ADR OF STATUS ROUTINE
        PCHL
ZSTAT1  CMA             ; FLIP FLAGS
        ANI     1       ; SET FLAGS -- 0 MEANS CHAR READY
        CALL    GET     ; RESTORE REGS
        RET
*  CHAR OUTPUT TO LST:
ZPOUT   PUSH    PSW     ; SAVE A
        CALL    PUT     ; SAVE REGS
        MOV     C,A     ; CHAR IN C
        CALL    SKCHEK  ; CHECK FOR SKIPPING; RET W/NZ IF YES
        JNZ     ZOUT1   ; DON'T PRINT IF SO
        LXI     H,ZCUT1 ; SET UP RET ADR
        PUSH    H
        LHLD    PRADR   ; GET ADR OF ROUTINE
        PCHL
*  CHECK FOR ABORT
ZINK    CALL    ZSTAT   ; CHAR READY?
        ORA     A       ; 0 MEANS YES
        RNZ
*  WAIT FOR ANY KEY AND ABORT IF <ESC> OR CTRL-C
ZESC    CALL    ZIN     ; GET CHAR
        CPI     ESC     ; <ESC>?
        JZ      ZEOR
        CPI     CTRLC   ; CTRL-C?
        JZ      ZEOR
        RET
*  RETURN TO CP/M
ZEOR    LDA     DOUT    ; DISK OUTPUT?
        ORA     A       ; 0=NO
        JZ      BOOT
        CALL    F$CLOS  ; CLOSE OUTPUT FILE
        JMP     BOOT
*  EXCHANGE NYBBLES OF A REG
ZEN     RLC             ; ROTATE 4 BITS
        RLC
        RLC
        RLC
        RET
*  PRINT LINE PTED TO BY RET ADR UNTIL 0 ENCOUNTERED ON LST: OR CON:
PRNTP   XTHL            ; GET RET ADR & SAVE HL
PRNTP1  MOV     A,M     ; GET CHAR
        ORA     A       ; 0=DONE
        JZ      ZPRR2
        CALL    POUT    ; PRINT ON APPROPRIATE DEVICE
        INX     H       ; PT TO NEXT CHAR
        JMP     PRNTP1
*  PRINT LINE PTED TO BY RET ADR UNTIL 0 ENCOUNTERED ON CON:
ZPRR    XTHL            ; GET ADR & SAVE HL
        CALL    ZCR     ; NEW LINE
ZPRR1   MOV     A,M     ; GET CHAR
        ORA     A       ; 0 MEANS DONE
        JZ      ZPRR2
        CALL    ZOUT    ; PRINT IT
        INX     H
        JMP     ZPRR1
ZPRR2   XTHL            ; RESTORE ADR & HL
        RET
*  PRINT <CR> <LF> ON CON:
ZCR     MVI     A,0DH   ; <CR>
        CALL    ZOUT
        MVI     A,0AH   ; <LF>
        JMP     ZOUT
*  MOVE W/COUNT IN C
LCIR    MVI     B,0     ; B=0
*  LDIR SUBSTITUTE ROUTINE
LIR     MOV     A,M     ; GET BYTE
        STAX    D
        INX     D       ; PT TO NEXT
        INX     H
        DCX     B       ; COUNT DOWN
        MOV     A,B
        ORA     C
        JNZ     LIR
        RET
*  FILL MEMORY PTED TO BE DE WITH BYTE IN A; B=BYTE COUNT
FILL    STAX    D       ; FILL IT
        INX     D       ; PT TO NEXT
        DCR     B
        JNZ     FILL
        RET
*  (HL)=(HL)+(A)
ADR     ADD     L
        MOV     L,A
        RNC
        INR     H
        RET
*  CAPITALIZE CHAR IN A IF LOWER-CASE ALPHABETIC
CAPS    CPI     61H     ; SMALL A
        RC
        CPI     7BH     ; SMALL Z + 1
        RNC
        SUI     020H    ; MASK FOR CAPITAL
        RET
*
```

```
*************************************************************
***  BYTE-ORIENTED FILE OUTPUT ROUTINES — FILEO            **
*************************************************************

*
*  FILEO.ASM — BYTE-ORIENTED FILE OUTPUT
*    INCLUDED ROUTINES ARE —  FILE OUTPUT OPEN, FILE OUTPUT CLOSE, PUT
*       F$OPEN — OPEN OUTPUT FILE
*       F$CLOS — CLOSE OUTPUT FILE
*       F$PUT — PUT BYTE INTO OUTPUT FILE
*


*
*  SUPPORTING ROUTINES
*
*  F$ABORT — ABORT PROCESSING
*
F$ABORT:
        CALL    ZPRR
        DB      0DH,0AH,'FILEO — FILE ERROR — ABORTING',0
        JMP     BOOT
*
*  OERR — PUT ATTEMPTED WITHOUT OPENING FILE
*
F$OERR:
        CALL    ZPRR
        DB      0DH,0AH,'FILEO — PUT ATTEMPTED WITHOUT OPENING FILE',0
        JMP     BOOT
*
*  WRIT$BLOCK — WRITE BLOCK TO OUTPUT FILE
*
WRIT$BLOCK:
        CALL    F$LOGIN ; LOGIN OUTPUT DRIVE
        LXI     H,O$BUF ; PT TO OUTPUT BUFFER
        LXI     D,BUFF  ; PT TO TEMP BUFFER
        MVI     C,128   ; 128 BYTES
        CALL    LDIR    ; COPY FROM HL TO DE FOR C BYTES
        LXI     D,O$FCB ; PT TO DEFAULT FCB
        MVI     C,B$WR  ; WRITE BLOCK
        CALL    BDOS
        ORA     A       ; OK?
        JNZ     F$ABORT
        CALL    F$LOGOUT        ; LOGOUT OUTPUT DRIVE
        RET
*
*  F$OPEN -- OPEN FILE WHOSE FCB IS PTED TO BY DE FOR OUTPUT
*
F$OPEN:
        PUSH H ! PUSH D ! PUSH B
        CALL    F$LOGIN ; LOGIN OUTPUT DRIVE
        LXI     H,O$FCB ; PT TO DEFAULT OPEN FCB
        PUSH    H       ; SAVE PTR TO FCB
        XCHG            ; HL PTS TO FCB, DE PTS TO BUFFER AREA
        MVI     C,33    ; 33 BYTES TO MOVE
        CALL    LCIR    ; MOVE IT
        POP     D       ; GET PTR TO FCB
        PUSH    D       ; SAVE PTR
        MVI     C,B$SF  ; SEARCH FOR FILE
        CALL    BDOS
        CPI     255     ; NO MATCH?
        JZ      F$OPEN1 ; PROCEED TO OPEN IT IF NO MATCH
        CALL    ZPRR
        DB      0DH,0AH,'OUTPUT FILE EXISTS -- DELETE IT (Y/N/<CR>=Y)? ',0
        CALL    ZIN     ; GET RESPONSE
        CALL    CAPS    ; CAPITALIZE
        CPI     'N'     ; NO?
        JZ      F$ABORT
        CALL    ZCR
        POP     D       ; GET PTR TO FCB
        PUSH    D       ; SAVE PTR TO FCB
        MVI     C,B$DF  ; DELETE FILE
        CALL    BDOS
F$OPEN1:
        POP     D       ; GET PTR TO FCB
        MVI     C,B$MF  ; MAKE FILE
        CALL    BDOS
        CPI     255     ; 255 MEANS NOT OK
        JZ      F$ABORT
        LXI     H,O$BUF ; PT TO BUFFER
        SHLD    O$PTR   ; SAVE PTR
        MVI     A,128   ; SET COUNT
        STA     O$CNT
        MVI     A,0FFH  ; SET FILE OPENED FLAG
        STA     O$OFLG
        CALL    F$LOGOUT        ; LOGOUT OUTPUT DRIVE
        POP B ! POP D ! POP H
        RET
*
*  F$PUT — PUT BYTE IN REG A INTO OUTPUT FILE
*
F$PUT:
        PUSH H ! PUSH D ! PUSH B
        PUSH    PSW     ; SAVE PSW
        LDA     O$OFLG  ; GET FILE OPENED FLAG
        ORA     A       ; ZERO MEANS NO
        JZ      F$OERR
        POP     PSW     ; GET PSW
        PUSH    PSW     ; SAVE IT AGAIN
        LHLD    O$PTR   ; GET PTR TO NEXT BYTE
        MOV     M,A     ; STORE BYTE
        INX     H       ; PT TO NEXT
        SHLD    O$PTR
        LDA     O$CNT   ; GET COUNT
        DCR     A       ; DECREMENT
        STA     O$CNT
        JNZ     F$PUT1  ; RETURN IF OK
*  BUFFER FULL — WRITE IT TO DISK AND RESET POINTER AND COUNT
        LXI     H,O$BUF ; RESET POINTER
        SHLD    O$PTR
        MVI     A,128   ; RESET COUNT
        STA     O$CNT
        CALL    WRIT$BLOCK
*  NORMAL EXIT
F$PUT1:
        POP     PSW     ; GET PSW
        POP B ! POP D ! POP H
        RET
*
*  F$CLOS — CLOSE FILE OPENED FOR OUTPUT
*
F$CLOS:
        PUSH    PSW     ; SAVE A
        PUSH H ! PUSH D ! PUSH B
        CALL    F$LOGIN ; LOGIN OUTPUT DRIVE
        MVI     A,CTRLZ ; PUT CTRL-Z
        CALL    F$PUT
F$CLOSE1:
        LDA     O$CNT   ; EVEN BLOCK JUST WRITTEN?
        CPI     128     ; JUST CLOSE IF SO
        JZ      F$CLOSE2
        XRA     A       ; PUT ZERO
        CALL    F$PUT
        JMP     F$CLOSE1
F$CLOSE2:
        XRA     A       ; A=0
        STA     O$OFLG  ; SET OUTPUT OPENED FLAG
        LXI     D,O$FCB ; PT TO OUTPUT FCB
        MVI     C,B$CL  ; CLOSE FILE
        CALL    BDOS
        CPI     0FFH    ; ERROR?
        JNZ     F$CLOSE3
        CALL    ZPRR
        DB      0DH,0AH,'FILEO — ERROR IN CLOSING FILE',0
        JMP     BOOT    ; WARM BOOT TO CP/M
F$CLOSE3:
        CALL    F$LOGOUT        ; LOGOUT OUTPUT DRIVE
        POP B ! POP D ! POP H
        POP     PSW     ; RESTORE A
        RET
*
*  LOG IN OUTPUT DRIVE
*
F$LOGIN:
        LDA     CUR$DRV ; GET CURRENT DRIVE
        STA     TEMP$DRV        ; SAVE
        LDA     OUT$DRV ; GET OUTPUT DRIVE
        JMP     SETDRV  ; LOG IN
*
*  LOG OUT OUTPUT DRIVE
*
F$LOGOUT:
        LDA     TEMP$DRV        ; GET CURRENT DRIVE
        JMP     SETDRV  ; LOG OUT

*
*  BUFFERS
*
O$OFLG: DB      0       ; OUTPUT FILE OPENED FLAG (0=NO)
O$FCB:  DS      33      ; OUTPUT FILE FCB
O$BUF:  DS      128     ; OUTPUT BUFFER
```

```
O$PTR:  DS      2       ; OUTPUT CHAR PTR
O$CNT:  DS      1       ; OUTPUT CHAR COUNT

*
*  CP/M EQUATES AND ASCII CONSTANTS
*
B$CL    EQU     16      ; CLOSE FILE
B$SF    EQU     17      ; SEARCH FOR FILE
B$DF    EQU     19      ; DELETE FILE
B$MF    EQU     22      ; MAKE FILE
B$WR    EQU     21      ; WRITE NEXT RECORD

*****************************************************************
**** END OF FILEO                                              **
*****************************************************************
*
```

```
*
*  TFS RESIDENT COMMAND TABLE!
*
CCNT    EQU     4         ; # CHARS IN A CMND
CTAB    DB      55
        DB      'KB  '    ; $KB
        DW      KB
        DB      'AP  '    ; $AP — TOGGLE
        DW      APAR
        DB      'STOP'    ; $STOP
        DW      EXIT
        DB      'HALT'    ; $HALT
        DW      EXIT
        DB      'EXIT'    ; $EXIT
        DW      EXIT
        DB      'LOOP'    ; $LOOP
        DW      LOOPLP
        DB      'ENDL'    ; $ENDL
        DW      LPEND
        DB      'LEX '    ; $LEX
        DW      LPEXIT
        DB      'RJ  '    ; $RJ
        DW      RJ
        DB      'NORJ'    ; $NORJ
        DW      NORJ
        DB      'PAUS'    ; $PAUS TEXT
        DW      PAUSE
        DB      'UL  '    ; $UL — TOGGLE
        DW      UL
        DB      'ASIS'    ; $ASIS
        DW      ASIS
        DB      'BR  '    ; $BR
        DW      BREK
        DB      'CR  '    ; $CR
        DW      CARET
        DB      'P   '    ; $P
        DW      PAR
        DB      'PX  '    ; $PX
        DW      PARX
        DB      'PAR '    ; $PAR N N (INDENT, SPACING BET PARS)
        DW      STPAR
        DB      'PARX'  ; $PARX N N
        DW      STPARX
        DB      'LMAR'  ; $LMAR N (COLUMN NUMBER)
        DW      STLMAR
        DB      'LLEN'  ; $LLEN N (COLUMN COUNT)
        DW      STLLEN
        DB      'LINE'  ; $LINE N N (# TEXT LINES, PHYSICAL LINES/PAGE)
        DW      STLINE
        DB      'PGON'  ; $PGON N (LOC OF PAGE #)
        DW      STPAGE
        DB      'PGOF'  ; $PGOF
        DW      PAGEOF
        DB      'PAGE'  ; $PAGE
        DW      PAGE
        DB      'TP  '  ; $TP N (NUMBER OF LINES)
        DW      TPG
        DB      'SKIP'  ; $SKIP N (NUMBER OF LINES)
        DW      SKIP
        DB      'PNUM'  ; $PNUM N (NUMBER OF NEXT PAGE)
        DW      STPNUM
        DB      'HEAD'  ; $HEAD TEXT
        DW      HEAD
        DB      'FOOT'  ; $FOOT TEXT
        DW      FOOT
        DB      'C   '  ; $C TEXT
        DW      CEN
        DB      'CB  '  ; $CB — TOGGLE
        DW      CENB
        DB      'CH  '  ; $CH N TEXT (CHAPTER NUM, TEXT OF HEADING)
        DW      CHAP
        DB      'SAV '  ; $SAV
        DW      SAV
        DB      'RES '  ; $RES
        DW      RES
        DB      'REM '  ; $REM TEXT
        DW      NXTLN
        DB      'COPY'  ; $COPY N (NUM OF COPIES)
        DW      COPY
        DB      'ENDC'  ; $ENDC
        DW      CPYEND
        DB      'SP  '  ; $SP N (NUM OF SPACES BET LINES)
        DW      SPSET
        DB      'SETN'  ; $SETN N (N=VALUE TO SET REG N TO)
        DW      NEQ
        DB      'BS  '  ; %BS
        DW      BS
        DB      'N   '  ; %N
        DW      ND
        DB      'APND'  ; %APND A:FILENAME.EXT ('.EXT'='.TFS' IF OMITTED)
        DW      APND
        DB      'OPEN'  ; %OPEN A:DATAFILE.EXT
        DW      OPEN
        DB      'CLOS'  ; %CLOS
        DW      CLOSE
        DB      'READ'  ; %READ
        DW      READ
        DB      'T   '  ; %T N (COL TO TAB TO)
        DW      TAB
        DB      'SETR'  ; %SETR N N (REG NUM, VALUE)
        DW      SETR
        DB      'INCR'  ; %INCR N (REG NUM)
        DW      INCR
        DB      'R   '  ; %R N (REG NUM)
        DW      RINC
        DB      'DR  '  ; %DR N (REG NUM)
        DW      DR
        DB      'CLRR'  ; %CLRR
        DW      CLRR
        DB      'BLK '  ; %BLK CWORD (1ST CHAR BECOMES SIG BLANK)
        DW      BLANK
MMENDS  DB      'ENDM'  ; %ENDM
        DW      MMEND
        DB      'MAC '  ; %MAC MACNAME TEXT
        DW      MMBEG
*
*  END OF TFS RESIDENT COMMAND TABLE
*
*
```

```
DEXT    DB      '       TFS'
OUT$FILE:
        DB      0,'TFS     DOC',0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0,0
CUR$DRV:
        DS      1       ; CURRENT WORKING DRIVE
TEMP$DRV:
        DS      1       ; TEMPORARY DRIVE STORE
OUT$DRV:
        DS      1       ; DISK OUTPUT FILE DRIVE
DOUT:
        DS      1       ; DISK OUTPUT FLAG

CLIM    EQU     10
ENVIR1  EQU     $
CENFL   DS      1       ; CENTER LINE FLAG
CENBFL  DS      1       ; CENTER BLOCK TOGGLE FLAG
RJFLG   DS      1       ; RIGHT JUSTIFY FLAG
PSKIP   DS      1       ; # LINES BET PAR TO SKIP
PSKIPX  DS      1
PGCNT   DS      2       ; COUNT PAGES
PGFLAG  DS      1       ; PAGE FLAG
IDNT    DS      1
XDNT    DS      1
LMAR    DS      1       ; LEFT MARG SETTING
BUFLEN  DS      1       ; LENGTH OF OUTPUT LINE
ULINE   DS      1       ; UNDERLINE FLAG
ULFLG   DS      1       ; UL FLAG
FTFLG   DS      1       ; FOOT FLAG
HDFLG   DS      1       ; HEAD FLAG
SPCNT   DS      1       ; LINE SPACING
NO      DS      1       ; NUMBER
APFLG   DS      1       ; AUTO PAR ON/OFF FLAG
ENLEN   EQU     $-ENVIR1
RVTAB   DS      100     ; R
LSPFL   DS      1       ; LEADING <SP> FLAG
BLK     DS      1       ; SIG BLANK
NL1     DS      1       ; NUMBER OF TEXT LINES
NL1BF   DS      1       ; CNT BUFFER
NL2     DS      1       ; NUMBER OF EXTRA LINES
NULLS   DS      1       ; NUMBER OF NULLS
CPOS    DS      2       ; CURRENT POSITION IN OUTPUT LINE
NCHARS  DS      1       ; NUMBER OF CHARS IN OUTPUT LINE
```

```
CNEXT   DS      2       ; PTR TO NEXT WORD OR PART OF CMND
VLOOP   DS      1       ; VAR LOOP CNTR
TMP     DS      1       ; TEMP BUFFER
TMP1    DS      2
TEMP    DS      1
LPLP    DS      2       ; LOOP START PTR
LPEX    DS      2       ; LOOP EXIT PTR
LNLEN   DS      1       ; LINE LENGTH FOR PAGE NUMBERS
NCOPY   DS      1       ; CPY CNT
CPYLP   DS      2       ; CPY ADR
DFLG    DS      1       ; DATA FILE LOADED FLAG
DPTR    DS      2       ; DATA FILE RECORD POINTER (LINE)
EOFLG   DS      1       ; EOF OF DATA FILE READ FLAG
RDFLG   DS      1       ; RECORD READ FLAG; SAYS IF DATA FILE RECORD IS READ
RDFLG1  DS      1       ; INPUT LINE READ FLAG; SAYS IF INPUT LINE IS READ
RTEMP   DS      2       ; TEMP STORAGE FOR SOURCE PTR DURING RECORD READ
RTEMP1  DS      2       ; TEMP STORAGE FOR SOURCE PTR DURING INPUT LINE READ
CLFLG   DS      1       ; COPY LOOP ENGAGED FLAG
LLFLG   DS      1       ; LOOP LOOP ENGAGED FLAG
TABC    DS      1       ; TAB CNT
INADR   DS      2       ; ADR OF CON: INPUT ROUTINE
OUTADR  DS      2       ; ADR OF CON: OUTPUT ROUTINE
STADR   DS      2       ; ADR OF CON: STATUS ROUTINE
PRADR   DS      2       ; ADR OF LST: OUTPUT ROUTINE
ENVIR2  DS      ENLEN   ; AUX ENVIRON
        DS      1
HBUF    DS      140     ; HEADING BUFFER
        DS      1
FTBUF   DS      140     ; FOOTER BUFFER
        DS      1
LBUF    DS      140     ; LINE BUFFER
        DS      1
WBUF    DS      40      ; WORD BUFFER
WTBUF   DS      41      ; TEMPORARY WORD BUFFER
ATAB    DS      1       ; ADDRESS TABLE
        DS      20      ; ALLOW FOR 10 LEVEL NESTING
MTAB    DS      1       ; MACRO NAME TABLE
        DS      120     ; ALLOW FOR 20 MACROS
SKFLG   DS      2       ; SKIP COUNT
OFLAG   DS      1       ; OPTION FLAG
        ORG     $/256*256+256   ; START ON PAGE BOUNDARY
DATA    DS      512     ; DATA FILE BUFFER
        DS      128
```

```
INLEN   EQU     128
INLINE  DS      INLEN   ; INPUT LINE FROM CONSOLE
        DS      256     ; STACK AREA
STACK   EQU     $
ZBOF    EQU     $
ENDALL  EQU     $
B2HI1   EQU     DATA/256
B2HI    EQU     B2HI1+1

BOOT    EQU     0000H   ; WARM BOOT ADR
BDOS    EQU     0005H   ; BDOS ENTRY POINT
BUFF    EQU     80H     ; TEMPORARY CP/M BUFFER
FCB     EQU     5CH     ; FILE CONTROL BLOCK
CTRLC   EQU     'C'-40H ; ABORT CHAR
CTRLZ   EQU     'Z'-40H ; CTRL-Z
EOF     EQU     CTRLZ   ; EOF CHAR
ESC     EQU     1BH     ; <ESC>
CCHAR   EQU     '%'     ; COMMAND PREFIX CHARACTER

        END
```